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Editor's Note

Few concerns galvanize maritime enthusiasts more quickly than the preservation of historic ships. Examples abound of grass roots organizations emerging to save vessels of historic value which faced the scrapyard, but some of these efforts have failed. In this international maritime year, in which we observe the quincentenary of Christopher Columbus's historic voyages, increasing attention has focused on preservation not only of ships, but also of other elements of the maritime heritage. These efforts, however, are often solitary and uncoordinated. For example, the Lighthouse Preservation Society obtained $3 million in federal support for its Bicentennial Lighthouse Fund. Theirs was a wonderful accomplishment, but lamentably, other worthy projects have failed to attract necessary support.

Fortunately, the maritime preservation movement in the United States has received a recent stimulus through the creation of the National Maritime Alliance. The Alliance was formed to advance the shared interests of organizations dedicated to the preservation of any aspect of the American maritime heritage. It affirmed its goals at the National Maritime Heritage Conference held in Baltimore in 1991. The goals of the Alliance are to:

1. Promote development of the National Maritime Alliance as the significant national leadership group for maritime heritage issues.
2. Articulate a common philosophy for the preservation of maritime artifacts, skills, and values, justifying their importance as national and regional resources.
3. Promote adherence to established standards of performance in maritime preservation activities.
4. Increase communication between maritime heritage organizations to facilitate accessibility and exchange of information.
5. Promote development of curricula on maritime heritage for use in colleges, primary and secondary schools, and other educational institutions.
6. Document traditional maritime skills, and promote the transfer of knowledge of older craftsmen to others through vocational training, apprenticeships, etc.
7. Recognize and communicate the contribution of ethnic communities to American maritime heritage and culture.
8. Extend the rationale for maritime preservation to other preservationists and to public and private decision makers.
9. Encourage maritime experiential education.
10. Increase public awareness of the importance of maritime preservation through communication, books, media exposure, etc.
11. Encourage preservation of historic maritime resources in waterfront development projects.
12. Identify public and private funding sources for maritime heritage preservation, and promulgate information on successful techniques for improving self-sufficiency of maritime heritage organizations.
13. Promote and expand opportunities for maritime preservation organizations, including operators of historic and/or training vessels, to obtain insurance at affordable rates.

To achieve these goals, the Alliance has created a Board of Directors drawn from across the maritime community. Rafe Parker, Director of the Sea Education Association of Woods Hole, Massachusetts, is president of the Alliance, and Michael Naab of the National Trust for Historic Preservation serves as secretary-treasurer. The Trust also publishes the Alliance's newsletter *Maritime America*. Any interested person may join by writing for information to the National Maritime Alliance, Suite 403, 2000 L Street, NW, Washington, D.C. 20036.

The National Maritime Alliance stands as an advocate for the preservation of America's maritime heritage. If the Alliance succeeds in its ambitious goals to bring together disparate associations, councils, museums, and other organizations which compose the maritime community, the prospects for increased public understanding and support will be greatly enhanced. *The American Neptune* applauds this effort and will inform its readers of the Alliance's continued progress.

Another organization which brings together persons interested in maritime history is the North American Society for Oceanic History. NASOH is now finalizing plans for its sixteenth annual conference, to be hosted by the Naval Historical Center at the Washington Navy Yard on 23-25 April 1992. This year's conference theme will be the fiftieth anniversary of the Battle of the Atlantic. Readers who would like further information should contact Dr. William S. Dudley, Senior Historian, Naval Historical Center, Washington Navy Yard, Washington, D.C. 20374.

TIMOTHY J. RUNYAN

Cleveland, Ohio

The American Concrete Shipbuilding Program of World War I

WILLIAM J. WILLIAMS

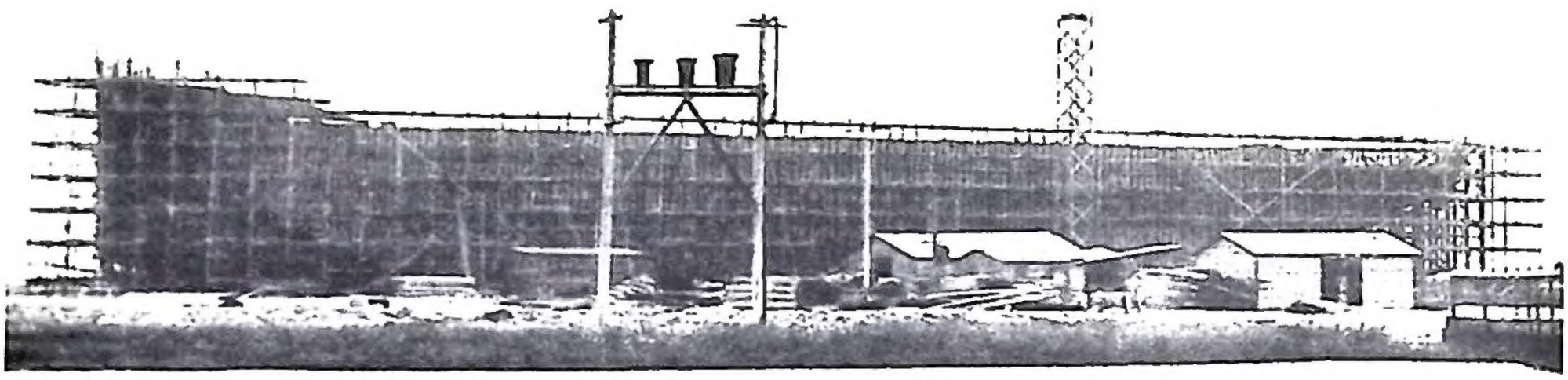
The United States Shipping Board, established in 1916, was responsible for overseeing the construction and operation of America's merchant marine during World War I. This was a massive task. When the United States entered the conflict, its small commercial fleet was not large enough to transport an army to France, or keep it supplied, or provide the Allies with the war materials and foodstuffs they needed. To accomplish these goals, the United States would have to rely largely on the merchant fleets of other nations, especially that of Great Britain. But the British tonnage available, already in short supply, was shrinking, for German U-boats were sinking hundreds of thousands of tons of merchant shipping every month. These losses had to be made good, but American shipyards only had the capacity to turn out a tiny fraction of the tonnage lost. Not even British yards, the world's most prolific prior to the war, could begin to produce the needed ships. Great Britain, and its allies, counted heavily on the newly formed Shipping Board to expand American ship production quickly and dramatically.

Unfortunately, the board got off to a rocky start. To supervise the shipbuilding program, it established the Emergency Fleet Corporation in April 1917. The corporation was a government-owned enterprise authorized to place orders for new merchant tonnage and to requisition that under construction. However, it quickly became mired in a controversy between its president, William Denman, who was also the chairman of the Shipping Board, and its general manager, Major General George W. Goethals, the famed builder of the Panama Canal. Denman wanted the American shipbuilding effort to focus on mass-producing a thousand small wooden steamers; Goethals saw this plan as impractical (as it indeed was) and wanted to concentrate primarily on the production of steel ships. By summer the dispute between the two men reached an impasse that seriously interfered with American ship production. This led President Woodrow Wilson to accept the resignations of both men on 24 July 1917.

Replacing Denman as chairman of the Shipping Board and president of the Emergency Fleet Corporation was Edward Nash Hurley, a Chicago businessman who had previously served Wilson as chairman of the Federal Trade Commission. Rear Admiral Washington Lee Capps became the Fleet Corporation's new general manager, but resigned a few months later due to poor health. Capps's replacement, Rear Admiral Frederic R. Harris, served only a few weeks — Hurley fired him for insubordination and named Charles Piez, a Chicago business acquaintance, as the new general manager. Hurley and Piez committed the Fleet Corporation to a massive steel construction program and scaled back Denman's wooden steamer scheme. Steel ships, though, took time to build. By late autumn, Congress and the public had become impatient with the controversies at the Fleet Corporation and with the seeming lack of progress in ship production. In December, the Senate Commerce Committee launched an investigation, and out of its hearings momentum developed for one of the most extraordinary experiments of the war — the large-scale construction of concrete steamers.[1]

On 26 January 1918, Roy H. Robinson, a midwestern building contractor, testified before the Commerce Committee about the advantages of ships made out of concrete. Robinson's appearance was arranged by Senator Porter J. McCumber, a Republican from North Dakota who had become intrigued by this innovative solution to

1. The early history of the Shipping Board can be traced in Edward N. Hurley, *The Bridge to France* (Philadelphia: J. B. Lippincott Company, 1927); W. C. Mattox, *Building the Emergency Fleet* (Cleveland: The Penton Publishing Company, 1920; reprint, New York: Library Editions, 1970); Darrell Hevenor Smith and Paul V. Betters, *The United States Shipping Board: Its History, Activities and Organization* (Washington D.C.: The Brookings Institution, 1931), and William J. Williams, "Shipbuilding and the Wilson Administration: The Development of Policy, 1914-1917" (Ph.D. diss., University of Washington, 1989).



The first large concrete vessel produced in the United States was the 4,500-ton *Faith*, shown under construction at Redwood City, California. Photo courtesy of the National Archives.

the shipping shortage. Although McCumber was not a member of the committee, he sat in on Robinson's testimony and actively participated in the questioning.

Robinson called for a large-scale program to produce concrete steamships. One such craft, built in Norway, had successfully completed a trial trip. Another, *Faith*, was under construction near San Francisco. Concrete vessels, Robinson contended, could be built faster, cheaper, and by less-skilled labor than steel or wooden ships. He also made the startling claim that a concrete steamer hit by a torpedo would not sink. The properties of a concrete hull, he said, would localize the damage, and repairing the vessel would be a simple matter of patching the hole with new concrete. Robinson's argument, confidently and professionally delivered, made a highly favorable impression on several members of the committee.[2]

Senator Wesley L. Jones, a Republican from Washington State, was one of those impressed by Robinson's testimony. On 29 January he asked the committee to vote on a resolution to have the Fleet Corporation study the "feasibility of concrete over-sea ship construction." The Republican Knute Nelson, a crusty old Civil War veteran from Minnesota, disdainfully rejected Jones's resolution as "rainbow chasing," but the committee approved the measure by a vote of five to two. Support for the resolution was bipartisan — Senator James E. Ransdell, a Democrat from Louisiana, and Senator Hiram W. Johnson, California's progressive Republican, both spoke in favor of Jones's position.[3]

The committee believed that the Fleet Corporation had overlooked the possibility of building concrete vessels. But that was not true; in fact, the corporation already had a concrete ship program underway. The possibility of using concrete in vessel construction had originally been proposed during the tenure of Denman and Goethals. But neither man showed any interest in the scheme, and by the

2. Mattox, *Building the Emergency Fleet*, 189; U.S. Congress, Senate Committee on Commerce, *Hearings on Senate Resolution 170 to Investigate All Matters Connected with the Building of Merchant Vessels under the Direction of the United States Shipping Board Emergency Fleet Corporation*, 65th Cong., 2d sess., 1219-1243, 1333-1334 (hereafter cited as *Senate Hearings*).

3. *Senate Hearings*, 1333-1334.

time of their dismissal, no action had been taken on building such craft.

When Hurley and Capps joined the Fleet Corporation they also ignored the possibility of concrete construction, at least initially. They apparently agreed with a memorandum prepared by Admiral H. H. Rousseau, head of the Fleet Corporation's Shipyard Plants Division, on 20 September 1917. It did "not seem to be desirable or necessary," Rousseau had argued, to begin a "large-scale experiment in the way of constructing reinforced concrete ships." Even if it were possible to build concrete hulls, Rousseau pointed out, the project would still be impractical because "the controlling element in any kind of construction" was the availability of "propelling machinery." Since the existing steel and wood programs were already outstripping the nation's capacity to produce marine engines, he said, building large numbers of concrete hulls would be of little value. Although Rousseau would later suggest that the Fleet Corporation might consider acquiring "a considerable number of ferro-concrete barges . . . for use by towing in coastwise, harbor and inland service," he continued to oppose the construction of concrete steamers.[4]

The San Francisco Shipbuilding Company, a private firm, believed concrete could be used for more than just barges. Convinced it could build and operate profitably concrete ships of 4,500 to 5,000 tons, the company had petitioned the Fleet Corporation in September 1917 for permission to construct "five reinforced concrete steamers" at Redwood City, California, that would be "free from commandeering, both during the course of construction and when completed." On 22 October, Hurley informed the company that the Shipping Board recognized "the importance of encouraging the construction of this new type of ship" and did not intend to requisition the initial concrete vessels produced. With this assurance, the California firm had begun work on its first ship, *Faith*.[5]

Permitting this limited private construction of concrete tonnage was as far as the Fleet Corporation was willing to go at that time. At the end of November, however, Secretary of Commerce William C. Redfield encouraged Hurley to pursue a more active concrete building program. "It has been my privilege for some years past to be more or less familiar with a variety of forms of reinforced concrete construction," Redfield wrote the Shipping Board chairman. "It has seemed to me that in the present emergency when ships are wanted as quickly as possible and at the lowest practicable cost not only that your Board may very well give thoughtful consideration to the dawning subject of concrete ships but that it is almost or quite a matter of duty to experiment with them." Redfield concluded his letter by offering to provide any assistance he could.[6]

Not finding Hurley responsive, the Secretary of Commerce then decided to advance the cause of concrete ships on his own. His avid support for this scheme was due, in large part, to Rudolph J. Wig, an "engineer-physicist" at the Commerce Department's Bureau of Standards. Wig had been studying "the adaptability of concrete for ship construction" since America's entry into the war. After carefully gathering and evaluating data, and then "making a personal investigation of the 4,500-ton concrete ship building at San Francisco *[Faith]*," Wig became convinced that the "advantages of concrete for shipbuilding [were] too important to ignore." He discussed this subject several times with Redfield, who was impressed by Wig's enthusiasm and technical knowledge. The more Redfield thought about the matter, the more convinced he became that concrete vessels were the most promising solution to the shipping crisis.[7]

Redfield introduced this subject at a cabinet meeting on 11 December and urged the adoption of a large-scale concrete shipbuilding program. Secretary of the Navy Josephus Daniels replied that such vessels were "still experimental" and mentioned that Hurley (who was not present) felt the same way. But Redfield was not deterred by Daniels's lukewarm response and continued to champion concrete ships.[8]

In mid-December Hurley yielded to Redfield's entreaties and agreed to proceed with a limited concrete

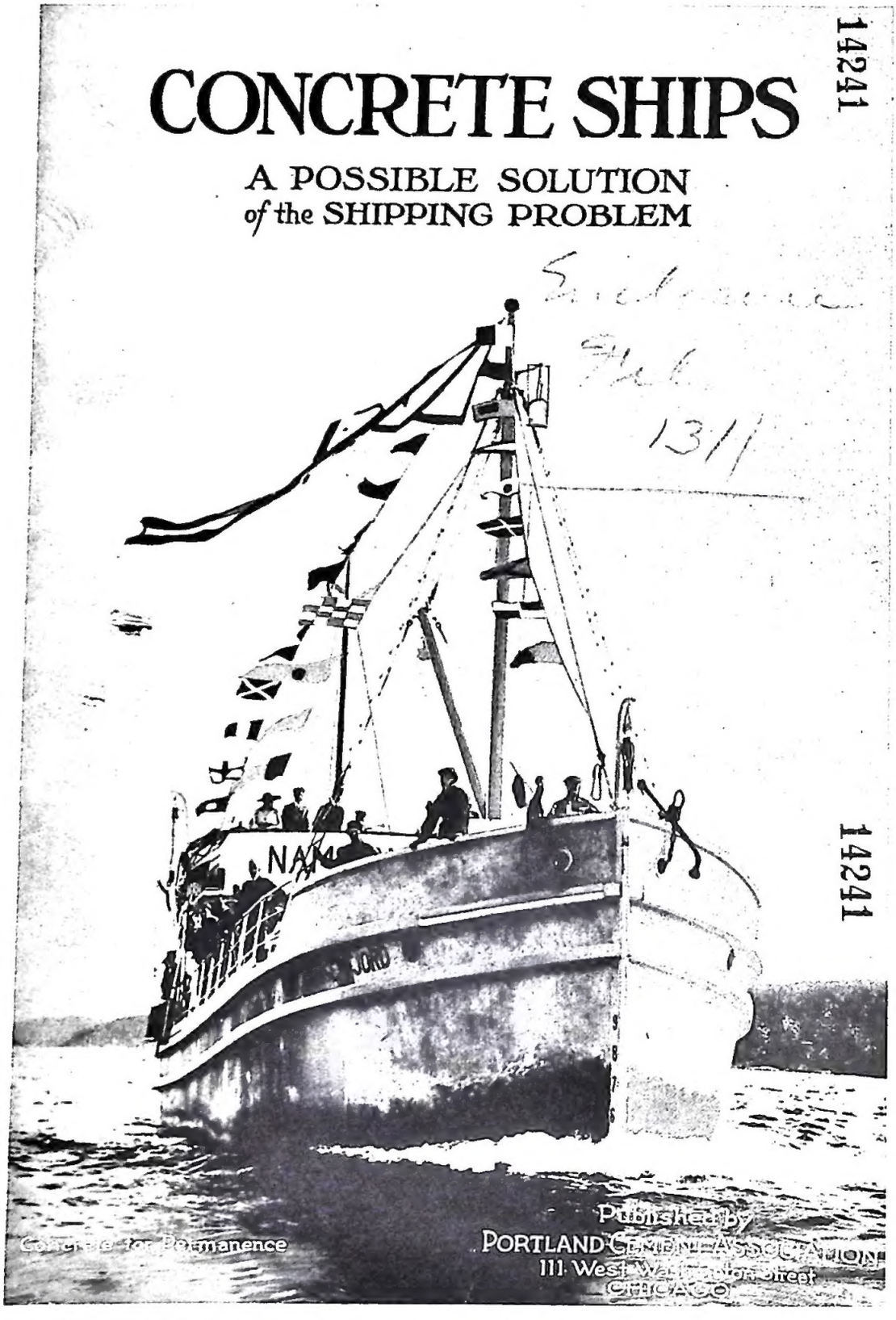
4. Denman to T. Harbour, 25 June 1917, Capps to E. Heidenreich, 21 August 1917, Box 47, Subject-Classified General Files, Records of the United States Shipping Board, Record Group 32, National Archives, Washington, D.C. (Hereafter this National Archives Record Group will be cited as NA, RG 32); Rousseau to Capps, 20 September, 17 October 1917, Box 84, Old General File, NA, RG 32.

5. *Washington Post*, 24 August 1917; San Francisco Shipbuilding Company to Capps, 26 September 1917, San Francisco Shipbuilding Company to Hurley, 11 October 1917, Hurley to San Francisco Shipbuilding Company, 22 October 1917, "Concrete Ships: A Possible Solution of the Shipping Problem," pamphlet prepared by Portland Cement Association, December 1917, Box 62, Subject-Classified General Files, NA, RG 32. All the tonnage figures provided are deadweight.

6. Redfield to Hurley, 20 November 1917, Box 62, Subject-Classified General Files, NA, RG 32.

7. Wig to Heyworth, 16 February 1918, Box 62, Subject-Classified General Files, NA, RG 32.

8. Josephus Daniels, *The Cabinet Diaries of Josephus Daniels*, ed. E. David Cronon (Lincoln, NE: University of Nebraska Press, 1963), 249; Redfield to Hurley, 15 December 1917, Box 62, Subject-Classified General Files, NA, RG 32.



During World War I, the Portland Cement Association used a forty-six page promotional pamphlet to extol the virtues of concrete ships. Photo courtesy of the National Archives.

program. The Shipping Board chairman apparently decided little would be lost by building a few concrete ships — if the craft proved seaworthy, more could be ordered. Hurley also allowed a group of Boston investors to build a concrete vessel with their own capital; if the ship was satisfactory, Hurley told them, the Fleet Corporation would purchase it and place contracts for others.

To oversee these activities, Hurley formed a Department of Concrete Ship Construction in late December, which he put administratively under the Fleet Corporation's Wood Ship Construction Division. He had Redfield release Wig from the Bureau of Standards to head this new department.[9]

Under Wig, the Department of Concrete Ship Construction moved rapidly to make arrangements for building concrete vessels. Thus, by the time the Commerce Committee passed Senator Jones's resolution on 29 January, all the measures it called for had already been enacted. At Wig's prodding, in fact, the Fleet Corporation had let two substantial contracts for concrete tonnage. The first, and largest, was with the Liberty Shipbuilding Company of Boston, a firm formed by the group of investors with whom Hurley had been in touch earlier. This contract called for the construction of fifty 3,000-ton concrete ships, the first of which was to be built at a yard in Brunswick, Georgia. The second contract, for six 3,500-ton ships, went to the Fougnier American Steel Concrete Shipbuilding Company of Flushing Bay, New York. Moreover, Wig was negotiating two additional contracts, one with the San Francisco Shipbuilding Company (currently constructing *Faith)* for a 7,500-ton merchant ship, and another with the Ferro Concrete Construction Company of Redondo Beach, California, for ten vessels of between 3,000 and 5,000 tons. In all these agreements there was an important restriction: the acquisition of more than one vessel was "contingent upon the seaworthiness and satisfactory character of the first ship built."

As Wig told Hurley on 30 January, his department was now sponsoring "the immediate construction of four or five experimental reinforced concrete ships, along different designs, to be built by different contractors." The "future program for the construction of concrete ships," Wig stressed, would depend upon the "success or failure" of these initial craft. For Wig, the problem of supplying these vessels with marine engines — the point Admiral Rousseau had emphasized — was a secondary consideration; his immediate goal was to demonstrate the seaworthiness of concrete hulls.[10]

Early in February, in response to Jones's resolution, Hurley and Piez forwarded information on Wig's department to the Commerce Committee. Senator Jones was pleased to learn what had been accomplished, but Knute Nelson of Minnesota did not share Jones's enthusiasm. In fact, Nelson was becoming increasingly suspicious of the concrete shipbuilding plan. During the war, the nation's construction industry had been severely curtailed due to war mobilization. This drop in building starts had hurt concrete manufacturers, and Nelson suspected that these businessmen, in an attempt to boost sagging sales, were the driving force behind the push for concrete ships.[11]

There was some justification for Nelson's suspicions. The Portland Cement Association, a trade organization of concrete manufacturers, actively publicized the need for concrete ships. One particularly effective item, which Nelson probably saw, was a slickly produced and richly illustrated forty-six page pamphlet titled "Concrete Ships: A Possible Solution of the Shipping Problem." The pamphlet argued that vessels made of concrete had numerous advantages: they were "fireproof," "ratproof," would "neither rot nor rust," were not susceptible to "wood-boring worms," required "practically no maintenance," could "withstand very rough usage," and could be "built quickly" and with "less labor" than other vessels. The pamphlet also suggested that their overall cost would be significantly lower than that of wood or steel ships. This publicity campaign was quite effective; Hurley later recalled that many Americans came to believe that "all you had to do was pour the concrete and get a ship the next day."[12]

Highly skeptical of all this, Senator Nelson advised the Fleet Corporation *not* to acquire concrete vessels.

9. Heyworth to Hurley, 13 December 1917, Hurley to D. Willard, 13 December 1917, Redfield to Hurley, 15 December, 27 December 1917, Hurley to Redfield, 20 December 1917, 11 January 1918, Box 62, Subject-Classified General Files, NA, RG 32.

10. Jean Haviland, "American Concrete Steamers of the First and Second World Wars," *The American Neptune* 22 (July 1962):158-159; Progress Report of the Division of Concrete Ship Construction, 30 January 1918, Box 220, Subject-Classified General Files, NA, RG 32.

11. *Senate Hearings*, 1851, 1553-1554; Wig to Heyworth, 16 February 1918, Box 62, Subject-Classified General Files, NA, RG 32.

12. "Concrete Ships: A Possible Solution of the Shipping Problem," pamphlet prepared by Portland Cement Association, December 1917, Box 62, Subject-Classified General Files, NA, RG 32; U.S. Congress, House Select Committee on U.S. Shipping Board Operations, *Hearings before Select Committee on U.S. Shipping Board Operations*, 66th Cong., 2d and 3d sess., 5124 (hereafter cited as *House Hearings on Shipping Board Operations*).

When Wig heard this he sought a conference with Nelson to explain "the whole history of the development of the concrete ship." As Wig put it in an internal Fleet Corporation memorandum: "I wish Mr. Nelson might understand that we have associated with us in working out the problem some of the most competent designing engineers and naval architects in the United States." Wig also pointed out that his work had begun before the "propaganda" campaign of the Portland Cement Association and had "absolutely no connection" to it. Nelson, though, remained a skeptic.[13]

The senator who most strongly disagreed with Nelson was Porter McCumber of North Dakota, who continued to call for a large concrete program. Motivated by patriotism, McCumber made this cause a personal crusade. In March, when large German offensives intensified the need for shipping in support of the American Expeditionary Force, McCumber visited the White House to present his arguments directly to President Wilson. Here his sincerity and persistence paid off.[14]

On 24 March, Wilson wrote a personal note to Shipping Board Chairman Hurley about the role concrete should play in the nation's shipbuilding program:

> My dear Hurley:
>
> I had a talk the other day with Senator McCumber which convinced me of his entire sincerity in urging the rapid construction of concrete ships upon a large scale and the very serious consideration of the particular plans for reinforced concrete construction set forth by Mr. Robinson. No doubt you have known of Mr. Robinson's proposals, but I was so impressed with Senator McCumber's earnestness and patriotic purpose that I want to ask if you will not give this matter of Robinson's proposals the most serious consideration, and then you and I can have a talk about the matter and try to get to the bottom of the question of policy involved, for I take it for granted it would mean an application to Congress for additional funds.
>
> I have promised Senator McCumber that I would give this my immediate attention, but, of course, I can't form a judgment about it without your assistance and cooperation.
>
> Faithfully yours,
>
> Woodrow Wilson[15]

13. Wig to Heyworth, 16 February 1918, Box 62, Subject-Classified General Files, NA, RG 32.

14. *Congressional Record*, 65th Cong., 2d sess., 31 January 1918, 1410; McCumber to Wilson, 22 March 1918, Box 62, Subject-Classified General Files, NA, RG 32.

15. Wilson to Hurley, 24 March 1918, Box 62, Subject-Classified General Files, NA, RG 32.

Now under pressure from both Capitol Hill and the White House to enlarge the concrete shipbuilding program, Hurley took action. He sent Piez a memorandum on 1 April:

> I would suggest that in view of the agitation in Congress by Senator McCumber and the recent letter from the President a telegram be sent to all the leading naval architects and concrete engineers of the country asking them to give their views at the earliest possible moment on the questions as to whether, in their judgment, 3,500, 5,000 or 7,500 ton concrete ships are practical. . . . If the reports are favorable, and Mr. Wig's opinion is that we should go ahead, we may ask Congress for $50,000,000 to build concrete ships.[16]

When the reports came in, not all were favorable. Some of the technical experts told the Fleet Corporation that concrete ships were not proven in service, had a much greater hull weight than steel or wooden ships, would probably deteriorate after prolonged exposure to salt water, might be too rigid to withstand the stresses caused by rough seas (especially if not fully loaded), and could disintegrate due to engine vibrations. These experts also questioned the claim that concrete ships could be built quickly and cheaply by unskilled labor, and scoffed at the contention that such vessels would be torpedo-proof. Another difficulty was the issue first raised by Admiral Rousseau — the nation's capacity to manufacture engines, turbines, boilers, and deck machinery was not sufficient to equip a large number of concrete hulls.[17]

Later events would demonstrate the validity of these observations. In April, however, the proponents of concrete ships were not discouraged. Senator McCumber suggested to Hurley that many shipping men were "somewhat rutted in their views and opinions, and intolerant of anything new." For his part, Wig stated that a "reinforced concrete ship [could] be built structurally equal to any steel ship," and argued that a large concrete

16. Hurley to Piez, 1 April 1918, Box 62, Subject-Classified General Files, NA, RG 32.

17. Hurley, *The Bridge to France*, 56-57; Haviland, "American Concrete Steamers," 158; *House Hearings on Shipping Board Operations*, 5124; Mattox, *Building the Emergency Fleet*, 191; *Emergency Fleet News*, 19 September 1918; *United States Naval Institute Proceedings* 44 (March 1918):652-653; McCumber to Hurley, 1 April, 2 April 1918, Hurley to McCumber, 1 April, 4 April 1918, Special Report for Edward N. Hurley on the Advisability of Constructing Concrete Ships, 5 April 1918, Memorandum for Mr. Hurley on Letter from Mr. Roy Robinson Regarding Concrete Ship Construction, 5 April 1918, Box 62, Subject-Classified General Files, NA, RG 32.

shipbuilding effort would "not in any way interfere with the steel and wood ship programs."[18]

Nevertheless, Wig realized that ships built of concrete had limitations. They might, he acknowledged, have relatively short life spans — perhaps only "three or four years." But this, he contended, was not very significant. "The present emergency calls for ships," he said, "and their life is not of great importance" — if they could serve for several years they could help defeat the Kaiser.

Yet Wig admitted that some claims made for concrete ships were preposterous, and he distanced himself from these pronouncements. "We are frequently asked," he told several reporters, "what will happen to the concrete ship if it is torpedoed?" The answer, he said, "is that the concrete ship hit directly by a torpedo will sink." He also emphasized that the notion that a concrete vessel could be produced in a few days was unrealistic, and he made it clear that a concrete hull could not be built any "more rapidly than a steel hull in a well-organized yard."

Overall, however, Wig remained firmly committed to a large concrete program. "If a concrete ship fails," he told reporters, "it is no cause for alarm. Some of them may not be successful." But he firmly believed that most concrete vessels would prove useful in service. On 2 April he recommended to Hurley "that immediate contracts be let for between 150 and 200 thirty five hundred ton concrete ships . . . all to be completed by 31 December 1918," and that additional orders be placed for "the construction of as many seventy five hundred ton ships as machinery [could] be provided for." Up to 250 of these larger vessels, Wig suggested, could be delivered by August 1919. All told, Wig proposed a massive concrete building program — up to 450 ships representing more than 2,500,000 tons.[19]

Wig's immediate superior at the Fleet Corporation, James O. Heyworth, the head of the Wood Ship Construction Division, called for a much smaller concrete program: nine 3,500-ton ships and between twenty and thirty vessels of 7,500 tons. This scaled-down proposal was much more in line with the views of Chairman Hurley, General Manager Piez, and the newly appointed Director General of the Emergency Fleet Corporation, the steel magnate Charles M. Schwab, all of whom considered the concrete ship idea "experimental."[20]

Hurley, Piez, and Schwab believed that "a 3,500-ton cargo ship [was] uneconomical to operate," and the three men recommended that design efforts concentrate "on ships of larger capacity." Having already designed a 3,500-ton vessel, Wig's engineers and naval architects now accelerated their work on plans for a 7,500-ton ship.[21]

By mid-April Hurley was ready to inform President Wilson of the Fleet Corporation's plans for concrete tonnage. There were still some technical problems, Hurley told Wilson, but the corporation had "developed the concrete ship to a point where it [seemed] advisable to carry out experiments on a larger scale." Accordingly, Congress would be asked for an "appropriation to cover an emergency fund for concrete ships." Although Hurley did not mention how many concrete vessels he was contemplating, his intention was to order two or three dozen, as Heyworth had recommended, not the several hundred Wig had suggested.[22]

During the next two weeks, the Fleet Corporation's concrete shipbuilding program began to take final form. Two concrete vessels ordered by the corporation in January were now underway: the Liberty Shipbuilding Company had started building a 3,000-ton ship at Brunswick, Georgia, and the Fougnier firm had begun work on a 3,500-ton vessel at Flushing Bay, New York. But contrary to its initial intentions, the Fleet Corporation now decided not to order any follow-on vessels at either of these yards, apparently because of the small size of the craft.

Another contract the corporation had negotiated in January, with the Ferro Concrete Construction Company, had been voided when that firm failed to meet the required progress deadlines at its Redondo Beach shipyard; thus, no vessels would be built there. The final firm with which the Fleet Corporation had been negotiating, the San Francisco Shipbuilding Company, had not yet received a contract, but the government was planning to have the company build one 7,500-ton concrete ship on a cost-plus basis.

18. *The Marine Review* 48 (October 1918):472-473; McCumber to Hurley, 1 April 1918, Wig to Hurley, 2 April 1918, Box 62, Subject-Classified General Files, NA, RG 32; Press Release, 13 April 1918, Box 16, Edward Nash Hurley Collection, University of Notre Dame Archives (hereafter cited as Hurley Papers).

19. *The Marine Review* 48 (September 1918):417; Press Release, 13 April 1918, Box 16, Hurley Papers; Wig to Hurley, 2 April 1918, Special Report for Edward N. Hurley on the Advisability of Constructing Concrete Ships, 5 April 1918, Box 62, Subject-Classified General Files, NA, RG 32.

20. Heyworth to Piez, 2 April 1918, Box 62, Subject-Classified General Files, NA, RG 32.

21. Haviland, "American Concrete Steamers," 161; Press Release, 13 April 1918, Box 16, Hurley Papers.

22. Hurley to Wilson, 13 April 1918, Box 62, Subject-Classified General Files, NA, RG 32.

Three key figures in the Shipping Board's debate over concrete ships were: right, Charles M. Schwab, Director General of the Emergency Fleet Corporation (from Edward N. Hurley, *The Bridge to France* [Philadelphia: J. B. Lippincott Company, 1927]); center, Edward N. Hurley, President of the Emergency Fleet Corporation and Chairman of the Shipping Board (from Robert Hesson, *Steel Titan: The Life of Charles M. Schwab* [New York: Oxford University Press, 1975]); and far right, Emergency Fleet Corporation Vice President and General Manager Charles Piez (from Hurley, *The Bridge to France*). Photos courtesy of the U.S. Air Force Academy.

In late April, the Fleet Corporation went beyond these existing arrangements and signed a contract with the Liberty Shipbuilding Company. This contract called for the construction of two 3,500-ton concrete ships as soon as possible, and later, six 7,500-ton ships, once Wig's naval architects had completed blueprints for these larger craft. The eight vessels were to be built at a new plant, with four shipways, to be constructed at Wilmington, North Carolina. The site for this yard was "furnished to the Emergency Fleet Corporation free of cost by the city of Wilmington," where local officials were anxious to attract wartime industry.

Under the terms of the contract, the Liberty Shipbuilding Company was to act as an "agent" of the government and supervise the "construction of both plant and ships." The firm would not be entitled to any profit on the construction of the shipyard, which would be government-owned, but would earn a profit on each ship it produced. This fee would be based on the estimated cost of the vessels, with the company earning bonuses for producing ships below the estimates or for early deliveries. The shipways at Wilmington's "agency yard" were to be completed "within approximately six weeks," with the first concrete hulls launched by October.[23]

These arrangements brought the total number of concrete ships the Fleet Corporation had on order to ten — nine to be built by the Liberty Shipbuilding Company (eight at Wilmington and one at Brunswick), and one by the Fougnier yard at Flushing Bay. But Hurley, Piez, and Schwab did not intend for this to be the corporation's entire concrete program. Piez told Heyworth on 1 May that, when additional appropriations were received from

23. Department of Concrete Ship Construction Progress Reports for the Weeks of February 18 to February 23 and February 25 to March 2 1918, Press Release, 24 April 1918, Piez to Heyworth, 1 May 1918, Box 62, Summary of Progress Report for Department of Concrete Ship Construction for Week Ending 27 April 1918, Box 216, Subject-Classified General Files, NA, RG 32; Concrete Ship Department to Schwab, 13 August 1918, File 40, Records of Charles M. Schwab, NA, RG 32.

Congress, the Fleet Corporation would "establish four other agency yards and [would] determine on an expanded program."

In May, with support from Senator McCumber, the Fleet Corporation requested from Congress a "special supplemental appropriation" of $50 million for the acquisition of concrete ships. This request, however, died in the House of Representatives when it was pigeonholed by the Appropriations Committee. The Fleet Corporation thus had to fund concrete construction out of the roughly $2.5 billion Congress appropriated for merchant shipbuilding during the war. Hurley, Piez, and Schwab decided to devote approximately $40 million of this amount to concrete vessels.[24]

As Piez had planned, this money was used to place four additional "agency contracts." One of these went to the San Francisco Shipbuilding Company. Instead of receiving an order for one 7,500-ton concrete vessel, as originally intended, this firm now got, on an agency basis, a contract to establish a four-way shipyard near Oakland to construct eight concrete vessels. Each of these was to be built according to a 7,500-ton design developed by Wig's naval architects. The site for the yard was leased to the Fleet Corporation, "for a period of 25 years without cost," by the city of Oakland. Agency contracts based on these exact same terms (the building of a four-way shipyard and the construction of eight 7,500-ton ships) were also let to firms that would build yards in

24. U.S. Shipping Board, *Second Annual Report of the United States Shipping Board* (Washington D.C.: Government Printing Office, 1918), 99-101; *The Marine Review* 48 (July 1918):300; *International Marine Engineering* 23 (July 1918):381-382; Piez to Heyworth, 1 May 1918, "Construction of Concrete Ships: Special Report Submitted to Edward N. Hurley . . . by Mr. McCumber," 8 May 1918, Box 62, Subject-Classified General Files, NA, RG 32; Hurley, *The Bridge to France*, 57; *House Hearings on Shipping Board Operations*, 5124; Smith and Betters, *The United States Shipping Board*, 27.

Jacksonville, Florida; Mobile, Alabama; and San Diego, California. Like Oakland, these three cities leased sites to the Fleet Corporation free of charge in order to attract government business.

The five agency contracts let by the Fleet Corporation brought the total number of concrete steamers on order to forty-two — thirty-eight ships of 7,500 tons, three of 3,500 tons, and one (at Brunswick) of 3,000 tons. These vessels, aggregating just under 300,000 tons, along with a few dozen small concrete barges, and several "130-foot river and harbor steamers," would constitute the Fleet Corporation's entire concrete program.[25]

Rudolph Wig was disappointed and frustrated at the limited scale of this effort. Early in June he told General Manager Piez how he felt. "The concrete ship," Wig complained, "is not at present an important phase of your construction program." Wig was also unhappy with the subordination of his Department of Concrete Ship Construction to Heyworth's Wood Ship Construction Division. As he told Piez:

> Mr. Heyworth's time and thought has been fully occupied with the problems of the Wood Ship Construction [Division], and he has not, therefore, been in a position where he could familiarize himself with the concrete ship work. He has only a very superficial idea of the work, and does not comprehend either the design or construction problems involved in the concrete ship.

If the task of building concrete vessels was going to be carried out efficiently, Wig concluded, his department would have to become the "Division of Concrete Ship Construction" — an organization coequal to the Fleet Corporation's large wood and steel ship divisions. If that could not be done, Wig told Piez, he would tender his resignation.[26]

A few days later, on 13 June, Piez invited Wig to his office. Wig recalled later that Piez said "he would not accept my resignation, but would rearrange the work so as to make it more satisfactory." Piez refused to create the separate division Wig wanted, but was willing to transfer Wig's department to the Division of Steel Ship Construction in order to remove it from Heyworth's control. Wig was not totally satisfied with this compromise, but agreed to accept the suggested arrangement, which remained in force for the duration of the war.[27]

Wig was not the only man frustrated by Piez's refusal to put concrete ships on an equal basis with steel and wooden vessels. Harvey Whipple, the managing editor of the trade journal *Concrete*, was bitterly disappointed to learn that only forty-two concrete ships would be built. "Hundreds of contractors stand ready with organizations, equipment, experience and millions of capital to build concrete ships," Whipple wrote in an editorial. If these legions of concrete contractors could be unleashed, he suggested, they could "come very near perhaps to doubling the now anticipated output of all ships for 1918." The only thing necessary for that to happen, Whipple concluded, would be for Hurley, the Shipping Board chairman, to go through the open "door of opportunity" that stood before him and launch a massive concrete program — and to do so at once, "before it [was] too late."[28]

Whipple got support on this issue from the *New York Tribune*. In a lengthy article dated 8 August, the *Tribune*, using the same general arguments as Whipple, indicated that ship production could be substantially increased by placing more emphasis on concrete. The article said that the Fleet Corporation had "consistently stalled on concrete boats." The *Tribune* went on to suggest that Hurley was "emotionally opposed" to this innovative approach to meeting the shipping crisis, and that his personal prejudice against concrete was severely hampering the war effort.[29]

This press attack angered Schwab, Hurley, and Piez. Schwab got in touch with the *Tribune* and stressed that he "emphatically" took exception to its article. Hurley responded by accusing the concrete ship advocates of greed. Their chief goal, he suggested (as Senator Nelson had earlier), was to get contracts to make up for business lost due to wartime restrictions on building construction. He told reporters on 11 August that "If any man comes in

25. Memorandum on Construction of Concrete Ships, 16 May 1918, Wig to Piez, 10 June 1918, Hurley to C. Nichols, 15 October 1918, Box 62, Summary of Progress Report for Department of Concrete Ship Construction for Week Ending 27 April 1918, Box 216, Subject-Classified General Files, NA, RG 32; Memorandum for Mr. Schwab, 31 May 1918, Concrete Ship Department to Schwab, 13 August 1918, Wig to Schwab, 26 September 1918, File 40, Records of Charles M. Schwab, NA, RG 32; William N. Still, Jr., "Shipbuilding in North Carolina: The World War I Experience," *The American Neptune* 41 (July 1981):196-197; U.S. Shipping Board, *Second Annual Report* (1918), 110, 142-143.

26. Wig to Piez, 10 June 1918, Box 62, Subject-Classified General Files, NA, RG 32.

27. Wig to Hurley, 12 July 1918, Box 62, General Order No. 63, 18 June 1918, Box 184, Subject-Classified General Files, NA, RG 32.

28. Harvey Whipple, "Mr. Hurley's Opportunity," *Concrete* 13 (August 1918):1 (copy in Box 62, Subject-Classified General Files, NA, RG 32).

29. *New York Tribune*, 8 August 1918.

the interest of something somebody wants to unload on the government, just because it is wartime and the men behind him need the money, he is going to get a mighty cool reception. We are not going to plunge or gamble with the people's money. I hope that is plain."[30]

Meanwhile, Piez published a lengthy rebuttal to the *New York Tribune*'s article in the Fleet Corporation's official organ, the *Emergency Fleet News*. He pointed out that even if hundreds of concrete hulls could be launched, U.S. factories could not produce enough marine engines and machinery to equip them. Moreover, the labor needed to install this machinery was in short supply, and diverting it from existing shipyards would "interfere immediately and substantially" with the steel and wood programs. It was these factors, Piez concluded, not "any inherent prejudice against the concrete ship," or "any lack of courage to try a new venture," that led the Fleet Corporation to limit the concrete ship program.[31]

Whipple was not deterred by this resistance from the corporation's top leadership. To win support for his cause, he wrote directly to Secretary of Commerce Redfield, one of the earliest proponents of concrete ships. Uncertain about how to respond to Whipple's arguments, Redfield forwarded the letter to the Emergency Fleet Corporation. In his reply, Piez stated that the corporation was willing "to try out this form of vessel," but did not want to make any rash decisions. The claim that hundreds of concrete hulls could be turned out in a matter of a few months, Piez believed, was illusory.[32]

The efforts of Whipple and other concrete ship enthusiasts failed, in the end, to get the government to expand its program beyond forty-two vessels. Moreover, not one of these would be launched before the armistice. Piez had been right — the claims of those who had called for the rapid construction of concrete ships proved to be unrealistically optimistic.[33]

After the fighting stopped, the Fleet Corporation canceled all but twelve of the concrete ships it had on order, and the dozen vessels that survived did not have any commercial success. As the maritime historian Jean Haviland points out, their "most obvious defect [was] the great weight of the hull compared to the cargo-carrying capacity." This made concrete steamers relatively expensive to operate, which meant they could not compete on postwar trade routes against more efficient steel ships.[34]

In his postwar memoirs, Hurley wrote that: "No one in the Shipping Board or the Fleet Corporation ever favored the concrete ship. Senator McCumber was responsible, more than any one else, for the experiments that we made with this type." In a 1931 study of the Shipping Board, the Brookings Institution reached a similar conclusion, contending that the "concrete ship was a congressional idea and was so sponsored and financed."[35] These statements are misleading. For one thing, Congress never did vote funds specifically earmarked for concrete ships. For another, there were many key individuals outside of Congress who played an important role in launching the concrete ship scheme, including Secretary of Commerce Redfield, Rudolph J. Wig, Harvey Whipple, the Portland Cement Association, and even, at one point, President Wilson. Nonetheless, the Senate Commerce Committee's resolution on concrete ships, and the intense personal crusade of Senator McCumber, were crucial factors in the development of the Fleet Corporation's concrete construction program. Because of this congressional pressure the program was larger than it otherwise would have been — albeit not nearly as large as the advocates of concrete ships would have liked.

30. Ibid., 11 August 1918; *New York American*, 12 August 1918; *New York World*, 11 August 1918.

31. *New York Tribune*, 12 August 1918; *The Marine Review* 48 (October 1918):472-473; *Emergency Fleet News*, 19 September 1918.

32. Piez to Redfield, 20 October 1918, Box 62, Subject-Classified General Files, NA, RG 32; *The Marine Review* 48 (October 1918):473.

33. *Emergency Fleet News*, 19 September 1918; Hurley to W. Kettner, 9 November 1918, Copy of an article published by the *Nautical Gazette*, 17 May 1918, Box 296, Subject-Classified General Files, NA, RG 32; U.S. Shipping Board, *Third Annual Report* (1919), 70-71; Arthur E. Cook, *A History of the United States Shipping Board and Merchant Fleet Corporation* (Baltimore: Day Printing Co., 1927), 29.

34. Mattox, *Building the Emergency Fleet*, 104-105, 192-194; Haviland, "American Concrete Steamers," 165.

35. Hurley, *The Bridge to France*, 56; Smith and Betters, *The United States Shipping Board*, 27.

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Weather-Reporting U-boats in the Atlantic, 1944-45: The Hunt for U-248

DAVID SYRETT

The Germans lost the Battle of the Atlantic in 1943. Heavy casualties suffered at the hands of Allied convoy escorts forced the U-boats to withdraw from the North Atlantic in May 1943.[1] Then, American hunter-killer groups, built around escort aircraft carriers, drove the U-boats out of the Central Atlantic in the summer and autumn of 1943.[2] In October and November of that same year, Allied forces again drove the wolf packs from the convoy routes of the North Atlantic.[3] But even after the great convoy battles of 1943, the U-boats continued to fight, in the words of Grand Admiral Karl Dönitz, commander in chief of the German Navy, "a delaying action and, with as economic a use of our forces as possible, [to] continue to tie down the forces of the enemy."[4] The result was a maritime guerilla war that lasted until VE Day in 1945. Most U-boats were deployed in British coastal waters,[5] while a few others were dispatched to distant seas,[6] and still others were employed in such tasks as bringing goods through the Allied blockade[7] and making weather reports from the mid-Atlantic. In fact, as the Allies closed in on Germany in 1944-45, supplying meteorological information to the German armed forces became one of the most important military tasks of the U-boat service.

Throughout World War II, the Germans made a sustained effort to obtain meteorological information to support their military operations in Europe. Because weather patterns move from west to east, such information could only come from the North Atlantic. Thus, from the beginning of the war, the Germans employed U-boats, weather ships, and clandestine weather stations in Greenland to obtain meteorological intelligence from the North Atlantic. But because of Allied countermeasures directed at weather ships and clandestine weather stations, by December 1944 the Germans had to rely for the most part on weather-reporting U-boats stationed in the North Atlantic for meteorological information.[8]

The Germans had used weather-reporting U-boats from the beginning of the war, but U-boat meteorological intelligence missions were usually subordinated to regular naval operations in the first years of combat. However, beginning at the end of 1943 and continuing to the end of the war, the Germans stationed two or three U-boats in the North Atlantic for the sole purpose of issuing weather reports. The Atlantic was divided into three zones — north, central, and south — and a U-boat was assigned to each area with the task of producing regular weather reports. The coverage was usually complete, but when a U-boat did not send a weather report, the *Befehlshaber der unterseeboote* (BdU) was quick to reprimand and demand additional meteorological information. For example, on 6 May 1944, the BdU cautioned that the "omission of weather reports is of great disadvantage to waging of the war." And when the Allies invaded northwest Europe on 6 June 1944, the Germans assigned four additional U-boats, which were not regular weather reporters, to

1. S. W. Roskill, *The War at Sea*, vol. 2 (London, 1956), 351-381.

2. William T. Y'Blood, *Hunter-Killer: U.S. Escort Carriers in the Battle of the Atlantic* (Annapolis, MD, 1983).

3. Ministry of Defence (Navy), *The U-boat War in the Atlantic, 1939-1945*, vol. 3 (London, 1989), 25-40.

4. Karl Dönitz, *Memoirs: Ten Years and Twenty Days* (New York, 1959), 420.

5. *U-boat War in the Atlantic*, 3:43-46, 80.

6. See, for example, Michael L. Hadley, *U-boats Against Canada* (Kingston, Ontario, 1985), 249-271.

7. *U-boat War in the Atlantic*, 3:63-65.

8. David Syrett, "German Meteorological Intelligence from the Arctic and North Atlantic, 1940-1945," *The Mariner's Mirror* 73 (August 1985): 325-332.

make "urgently needed" weather reports from the mid-Atlantic.[9]

In his history of American naval operations in World War II, the late Professor Samuel E. Morison speculated that the Allied naval authorities knew about the weather-reporting U-boats, "but did not appreciate their significance."[10] Morison is only partly correct, for the Allies had been reading the radio transmissions to and from U-boats regularly since February 1942.[11] Also, the Allies knew from the beginning of 1944 that those U-boats assigned to make weather reports from the mid-Atlantic transmitted their meteorological data by means of "the short-weather cipher" two or three times each day at more or less regularly set times. Early in the summer of 1944, however, fearing that the Allies would locate the weather-reporting U-boats by D/F,[12] the Germans abandoned fixed schedules for transmitting. Instead, the U-boats were directed to "transmit irregularly in order to make it difficult for enemy D/F service to gain knowledge . . . ," and no attempt was to be made "to get through more than three times in succession."[13]

In the first sixteen days of December 1944, meteorological intelligence from the mid-Atlantic became very important strategically to the Germans. They were planning a huge counteroffensive in the Ardennes which required a period of at least ten days of continuous bad weather with very poor visibility to negate superior Allied air power.[14] To obtain the required meteorological information, the number of weather reports transmitted by the U-boats in the mid-Atlantic was increased from two or three per day to fifteen on 15 December, the day before the German offensive began.[15] Allied naval intelligence most likely noted this increase, but did not understand the importance of these weather reports.[16] However, after the German tanks came out of the fog in the Ardennes at dawn on 16 December 1944, U-boat weather reports from the mid-Atlantic took on a new significance. The point was further emphasized on 19 December when the Allies intercepted and read a radio transmission from the BdU to the weather-reporting U-boats saying that "your recent weather reports contributed decisively to determining the beginning of our great offensive in the West on 16/12."[17]

Consequently, on 25 December 1944, the commander in chief of the U.S. Atlantic Fleet decided to hunt down and sink one of the weather-reporting U-boats. The objective of this hunt was the U-1053.[18] However, this order was easier given than carried out, for a U-boat is very small and the sea is a huge place. Searching for and finding a single U-boat in the North Atlantic was in fact a very formidable task, similar in many respects to hunting for the proverbial "needle in a haystack." Finding and then sinking the U-1053 depended greatly on the skill of American naval intelligence in providing good information on the location of the U-boat, which was an absolute prerequisite for the success of the intended operation.

Radio communications between the U-boat and the BdU provided the only way that American naval intelligence could find the U-1053. The U-boat usually transmitted weather reports several times a day and from time to time received orders and directions from the BdU. The Americans could use these radio transmissions to locate the U-boat in three ways: by using D/F, by identifying the transmitter by means of the characteristics of the intercepted transmission, and by obtaining the contents of a radio communication through decryption.[19] In the hunt for the weather-reporting U-boat, the most important of these sources of information would be D/F.

German U-boat radio transmissions were picked up by a string of intercept stations along the east coast of the United States. After interception, the information was sent to Washington, D.C. for analysis. Enciphered U-boat radio messages were decrypted by the U.S. Navy's OP-20-GY(A)[20] at 3801 Nebraska Avenue in Washington. After being translated into English, the decrypts were sent by the hand of an officer or by a special secure teleprinter to the F-21 section of the Combat Intelligence Section in the

9. "Battle of the Atlantic: U-boat Operations," vol. 2, Record Group 457, SRH-008, National Archives, Washington, D.C., 98, 193-194. Hereafter this National Archives Record Group will be cited as NA, RG 457.

10. Samuel Eliot Morison, *History of United States Naval Operations in World War II*, vol. 10 (Boston, 1975), 332.

11. F.H. Hinsley, et al., *British Intelligence in the Second World War*, vol. 2 (London, 1981), 547.

12. Direction finding.

13. "Battle of the Atlantic: Technical Intelligence from Allied C.I.," NA, RG 457, SRH-025, 4:94-95.

14. Hugh M. Cole, *The Ardennes: Battle of the Bulge* (Washington, D.C., 1965), 22.

15. "Battle of the Atlantic: U-boat Operations," NA, RG 457, SRH-008, 2:229A.

16. Hinsley, *British Intelligence*, vol. 3, part 2, 489.

17. "Battle of the Atlantic: U-boat Operations," NA, RG 457, SRH-008, 2:230.

18. Morison, *Naval Operations* 10:332.

19. "A Preliminary Analysis of the Role of Decryption Intelligence in the Operational Phase of the Battle of the Atlantic," U.S. Navy OEG Report #66, 8/20/51, NA, RG 457, SRH-367, 011-012.

20. OP Office of the Chief of Naval Operations
20 Communications Division
G Communications Intelligence
Y Cryptanalysts
A Atlantic

Office of Commander-in-Chief U.S. Fleet (COMINCH). Adjoining F-21's main Submarine Tracking Room was F-211, the "Secret Room." Only five persons were permitted regularly into the Secret Room,[21] plus several high-ranking officers such as Admirals King, Edwards, and Low.[22] Both the Secret Room and OP-20-GY(A) were in close contact by radio and teleprinter with the Naval Section of the Government Code and Cipher School at Bletchley Park in England and with the Operational Intelligence Center's Submarine Tracking Room in the Admiralty in London. In the Secret Room, the contents of the decrypts were married with other intelligence, such as D/F fixes, ship and aircraft sightings of U-boats, reports of U-boat attacks, and prisoner of war interrogations, to produce a total intelligence picture. Intelligence, with its sources of information hidden, then moved out of the Secret Room to F-21's Submarine Tracking Room, to the Tenth Fleet's Convoy and Routing Section, and to various combat commands. The decryption of enemy radio transmissions and the operations of the Secret Room were the most closely-guarded secrets in wartime Washington, with the single exception of the work on the atom bomb.[23]

The intelligence obtained by the Navy from decryptions of German radio messages and from D/F fixes of U-boat radio transmissions was good, but very imperfect for hunting down and sinking a single weather-reporting U-boat. On 24 December 1944, using decrypts and D/F fixes, F-211 placed the location of the U-1053 at about 54°30'N 27°30'W.[24] This position was approximate, however, and in some respects an educated guess. The U-1053 gave her position in each of the weather reports she sent, and these reports were decrypted and read by the Americans. But in many cases, owing to the difficulties of navigation in a U-boat, these positions were nothing more than a dead reckoning position and could be miles off the true location of the vessel. D/F fixes were not much more accurate. The experience level of the D/F operator, the weather, and the ionosphere could all produce D/F errors. With six or seven bearings it was possible at long range to locate a transmitter at sea within twenty-five or thirty miles.[25] Thus, shore-based D/F fixes and information from decryptions could guide the hunters of the U-1053 to the general area where the U-boat was operating. But to locate the U-1053 within this general area required a shipborne locating device of greater range than radar and sonar and of more precision than German dead reckoning navigation and shore-based D/F fixes.

The Americans hoped that, upon arriving in the general area where the U-1053 was operating, they would be able to track down the U-boat with shipborne HF/DF.[26] The general idea was for the hunters of the U-1053 to use shore-based D/F to get "within favorable ground wave distance" of the U-boat and then track her down by taking bearings on her radio transmissions with HF/DF.[27] HF/DF, like radar, was a spin-off from research into the nature of the ionosphere by means of cathode-ray tubes. HF/DF sets incorporated a cathode-ray tube which could give an accurate visual bearing on a ground wave of a radio transmission very quickly. The Germans believed that if U-boat transmissions, such as weather reports, were very short in length — thirty seconds — they could not be picked up on conventional D/F equipment.[28] The Germans did not know of HF/DF until after the war and thought that the Allies could not locate the source of their very short radio transmissions.[29] So the Americans intended to exploit the Germans' lack of knowledge of HF/DF by deploying ships equipped with the latest type of HF/DF sets, known as "DAQ," to hunt for the U-1053.

On 19 December 1944, the U-1053 and two other U-boats were congratulated for their role in the Ardennes counteroffensive.[30] During the next nine days, the U-1053 made twenty-four weather reports which were intercepted by the Americans. These weather reports followed a pattern. The transmissions were made during the morning,

21. Commander Kenneth Knewles, USN, Commander F-21;
Lieutenant John E. Parsons, USNR, Commander Secret Room;
Lieutenant (jg) John V. Boland, USNR;
Ensign R. B. Chevalier, USNR;
Yeoman Samuel P. Livecchi, USN.

22. Admiral Ernest J. King, USN, Chief of Naval Operations (CNO), COMINCH.
Vice Admiral Richard S. Edwards, USN, Deputy CNO, Deputy COMINCH.
Rear Admiral Francis S. Low, USN, Chief of Staff, Tenth Fleet.

23. David Kahn, *Seizing the Enigma: The Race to Break the German U-Boat Codes, 1939-1943* (Boston, 1991), 237-244; "Functions of the 'Secret Room' (F-211) of COMINCH Combat Intelligence, Atlantic Section Anti-Submarine Warfare, WWII," (Undated), NA, RG 457, SRMN-038.

24. "COMINCH Rough Notes on Daily U-boat Positions and Activities 1943-1945," NA, RG 457, SRMN-034, f. 1178.

25. *Cf.* Kahn, *Seizing the Enigma*, 145.

26. High-frequency direction finding.

27. "COMINCH File of Memoranda Concerning U-boat Tracking Room Operations," 2 January 1943 - 6 June 1945, NA, RG 457, SRMN-032, 223.

28. Brian Johnson, *The Secret War* (London, 1978), 210-212.

29. *Cf.* Jurgen Rohwer, *The Critical Convoy Battles of March 1943* (Annapolis, MD, 1977), 200.

30. "German Navy/U-boat Message Translations & Summaries," 02 Feb. 1941 - 09 July 1945, NA, RG 457, SRGN-001-49668, f. 43073.

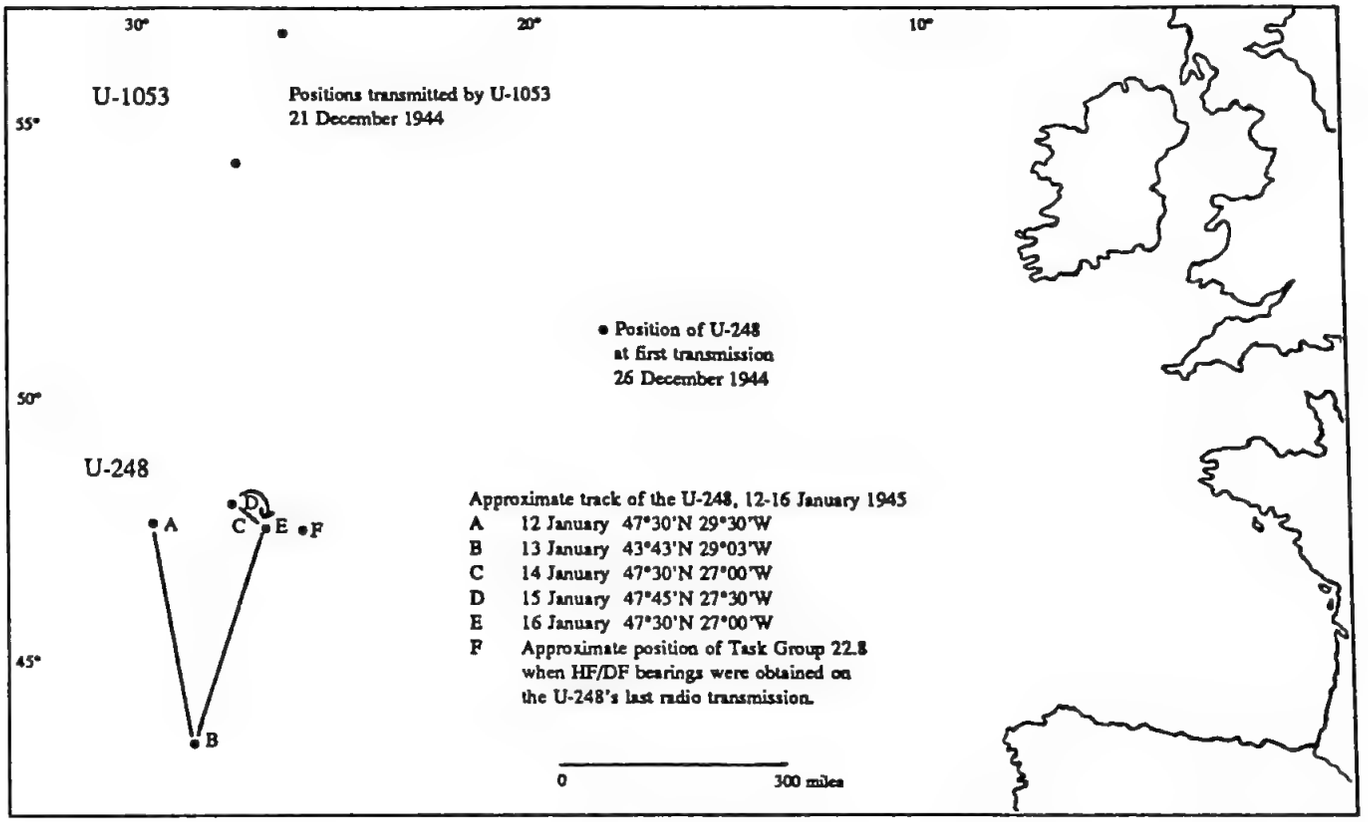


Figure 1: The radio transmissions sent by the German weather-reporting U-boats U-1053 and U-248 enabled U.S. Navy vessels to locate them in the Atlantic.

at midday, and late at night. The morning and night transmissions were "just off 54 meters" and the midday transmission was on 24 meters. Some transmissions were "just off 36 meters." For example, on 21 December the U-1053 sent three weather reports — at 0229Z, 1228Z, and 2049Z, just off 54, 24, and 54 meters. In these reports, the U-1053 gave its position as ranging between 54°30'N 27°30'W and 57°30'N 26°30'W (see figure 1), while American D/F fixes placed the vessel between 54°00'N 28°00'W and 55°30'N 25°00'W.[31] The U-1053's weather report radio transmissions were a model of regularity which presented the Americans with a clear target.

However, the U.S. Navy would not hunt down the U-1053, for she was relieved by another U-boat. On 21 December the U-248, commanded by Johann Loos, was ordered to 50°30'N 24°15'W to "ACT AS WEATHER U/B BECAUSE PLANNED RELIEF IS UNAVAILABLE."[32] Then, on 23 December, the U-248 was ordered to "OCCUPY SQ ((BD 5664:46.57N — 29.55W))" and to make weather reports three times a day. This message was decoded by the Americans at 1100 on 25 December,[33] and on 26 December the U-248 transmitted her first weather report from 51°30'N 18°30'W.[34] The position of the U-248 was some four degrees south and six degrees east of the position of the U-1053.[35] On 28 December the U-1053 was ordered to "SEND REPORTS ON RETURN CRUISE,"[36] and she then began to head northeast towards her base in Norway. On 1 January 1945 the U-1053 was ordered to cease transmitting weather reports.[37]

31. NA, RG 457, SRGN-001-49668, ff. 43008, 43090, 43103, 43104, 43116, 43117, 43129, 43130, 43144, 43145, 43155, 43157. 43167, 43179, 43182, 43199, 43202, 43206, 43207, 43212, 43213, 43220, 43223, 43231, 43141, 43251, 43260, 43279, 43282, 43292, 43296, 43297, 43308, 43316, 43321, 43352, 43353, 43364, 43366.

32. Ibid., f. 43144.
33. Ibid., f. 43215.
34. Ibid., f. 43302.
35. Ibid., f. 43308.
36. Ibid., f. 43356.
37. Ibid., f. 43538.

After taking up the duties of a weather-reporting U-boat on 26 December, the U-248 moved steadily south, transmitting two or three weather reports a day on either 36, 24, or 54 meters. By 6 January 1945, she had taken up a position in an area north of the Azores which she calculated as 45°30'N 30°30'W. American D/F fixes placed the U-248 somewhere between 46°30'N 29°00'W and 48°30'N 28° 00'W.[38] The radio transmissions of the U-248 were almost as regular as those of the U-1053, so she also presented the Americans with a very tempting target.

On 26 December 1944, the destroyer escorts USS *Otter*, USS *Hubbard*, and USS *Varian* sailed from Casco Bay, Maine "to hunt and kill [an] enemy weather-reporting submarine" which was operating north of the Azores. The Group would be joined later in the Azores by the destroyer escort USS *Hayter*. The plan was for the three destroyer escorts, known as Task Group (TG) 22.8, commanded by Commander J.F. Bowling, to proceed to Argentia to "top-off" their fuel and then steam to a point about five hundred miles north of the Azores to begin the search for the weather-reporting U-boat. However, when the three destroyer escorts were some sixty miles southwest of Argentia, the weather was so bad that Bowling decided not to enter that port, but to go to the Azores to refuel. On 3 January 1945, the three American destroyer escorts were refuelled from a tanker in the lee of Fayal Island in the Azores group, and then the American warships headed north to hunt for the U-248.[39]

Bowling's plan was to proceed to the area where shore-based D/F had last obtained a fix on the U-248. The three destroyer escorts would approach in a line abreast formation, with a distance of between 20,000 to 25,000 yards between each ship. They would attempt to get a HF/DF fix on the U-248 from the USS *Otter* and USS *Hubbard*, which carried the latest form of this equipment. Upon reaching the location of the latest shore-based D/F fix, which would be supplied by COMINCH, the three warships would then systematically search an area of one hundred by seventy miles with HF/DF for the U-248.[40] On 4 January, COMINCH estimated that the U-248 was located at approximately 47°30'N 38° 30'W.[41]

On the evening of 4 January 1945, as the three destroyer escorts were nearing the position of the latest COMINCH D/F fix, the USS *Hubbard* obtained a radar contact. This contact was considered "questionable." Nevertheless, the American destroyer escorts began to search for the U-boat because they had not obtained a good HF/DF bearing on the U-248 during the approach to the area. The hunt went on all night, and the region around COMINCH's latest D/F fix was also searched, but without result.[42]

On the afternoon of 5 January, the American warships began a sweep to cover an area of some fifty miles around 47°00'N 28°00'W. At 0129Z on 6 January, the U-248 issued a weather report which was placed by shore-based D/F fixes at 47°30'N 28°00'W.[43] This information was sent by radio to TG 22.8, and the search was extended northward and then back to the southwest. Only one poor HF/DF bearing was obtained, but Bowling decided nonetheless to extend the hunt during the night to an area thirty to one hundred miles west of 47°30'N 28°00'W. The Americans thought that while sweeping this area they had passed within twenty-five miles of the U-248 at least twice and perhaps a third time as well. At 0205Z the USS *Hubbard* ran over a whale, "demolishing" her sonar dome and projector. Nevertheless, the hunt continued. Between 1000Z and 1500Z on 7 January, while sweeping to the south southwest to 48°27'N 28°00'W, the task group obtained a good HF/DF fix. The Americans estimated that the U-248 was within forty miles, and the three destroyer escorts conducted a sweep with sonar down the bearings. Some forty-five miles along these bearings a sonar contact was obtained, and at 1845Z the USS *Otter* and *Varian* made a hedgehog[44] attack without result. The contact was judged false.[45]

It appeared from information sent by COMINCH and from the few HF/DF bearings that had been obtained that the U-248 was moving northward along the 29th meridian. Therefore, Bowling decided next to search a forty-five-mile large square centered around 48°40'N 28°45'W. The search began at 2100Z on 7 January. Several hours later, at 1247Z on 8 January, the USS *Hubbard* and USS *Otter*

38. NA, RG 457, SRGN-001-49668, ff. 4327, 43302, 43325, 43365, 43374, 43387, 43391, 43414, 43418,43421, 43444, 43457, 43472, 43520, 43518, 43529, 43551, 43563, 43574, 53575, 43583, 43603, 43619, 43621, 43640, 43658, 43665, 43689, 43690, 43710, 43711, 43718, 43730, 43741, 43742, 43769.

39. "General Narrative of Operations against Weather Reporting German U-boat, by Task Group 22.8, beginning 26 December 1944 and ending with its destruction on 16 January 1945," War Diary of USS *Varian*, 1-3 January 1945 (Naval Historical Center, Washington, D.C.), 1.

40. "General Narrative," 1-2.

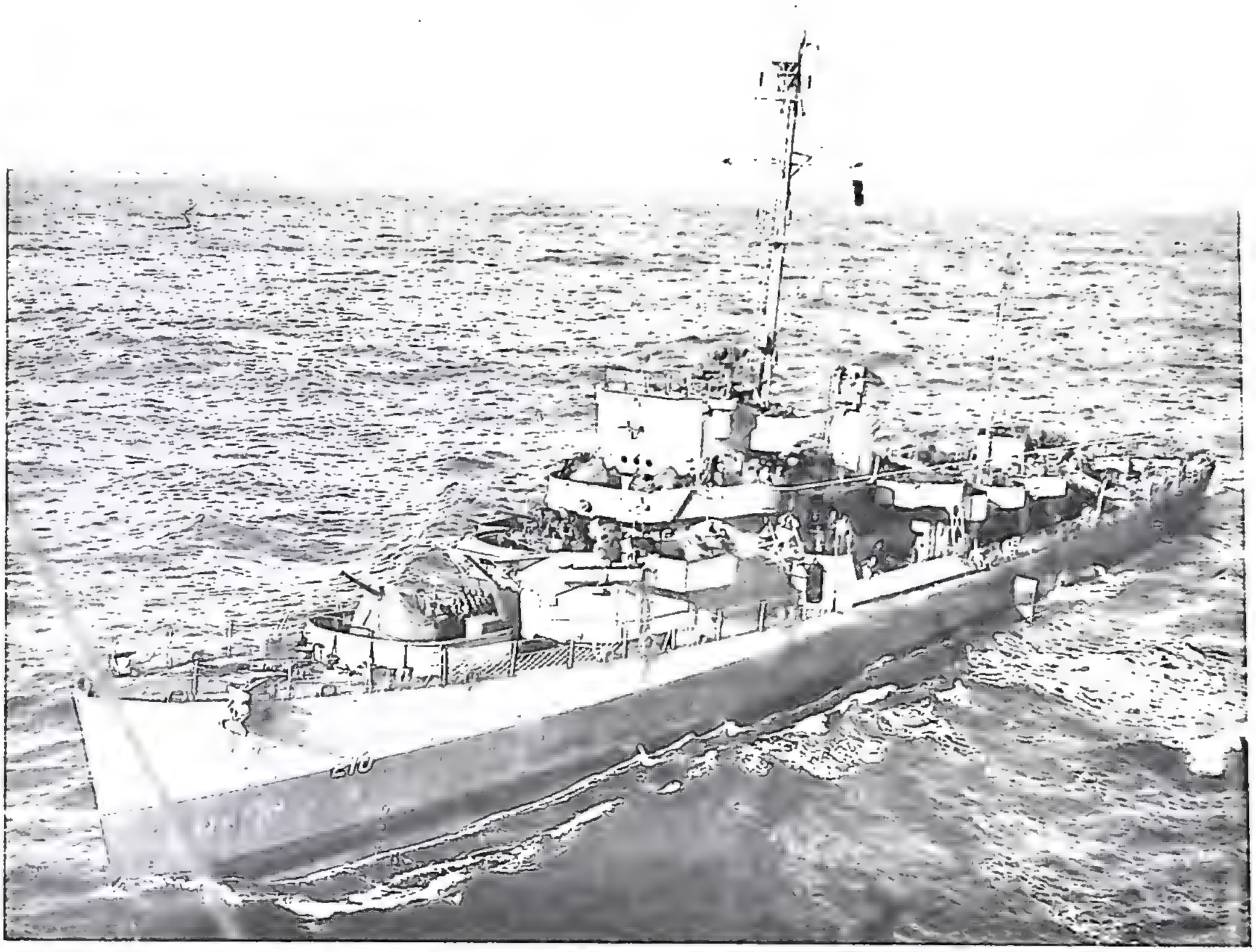
41. "COMINCH Rough Notes on Daily U-boat Positions and Activities 1943-1945," NA, RG 457, SRMN 034, f. 1199.

42. "General Narrative," 2.

43. NA, RG 457, SRGN-001-49668, f. 43718.

44. A mortar-like weapon which throws bombs forward of the vessel which explode on contact.

45. "General Narrative," 2.



Destroyer escort USS *Otter* was one of the vessels in Task Group 22.8 that participated in the hunt for U-248. Note the hedgehog forward and the HF/DF bird cage aerial at the top of the pole mast aft. Photo courtesy of the National Archives.

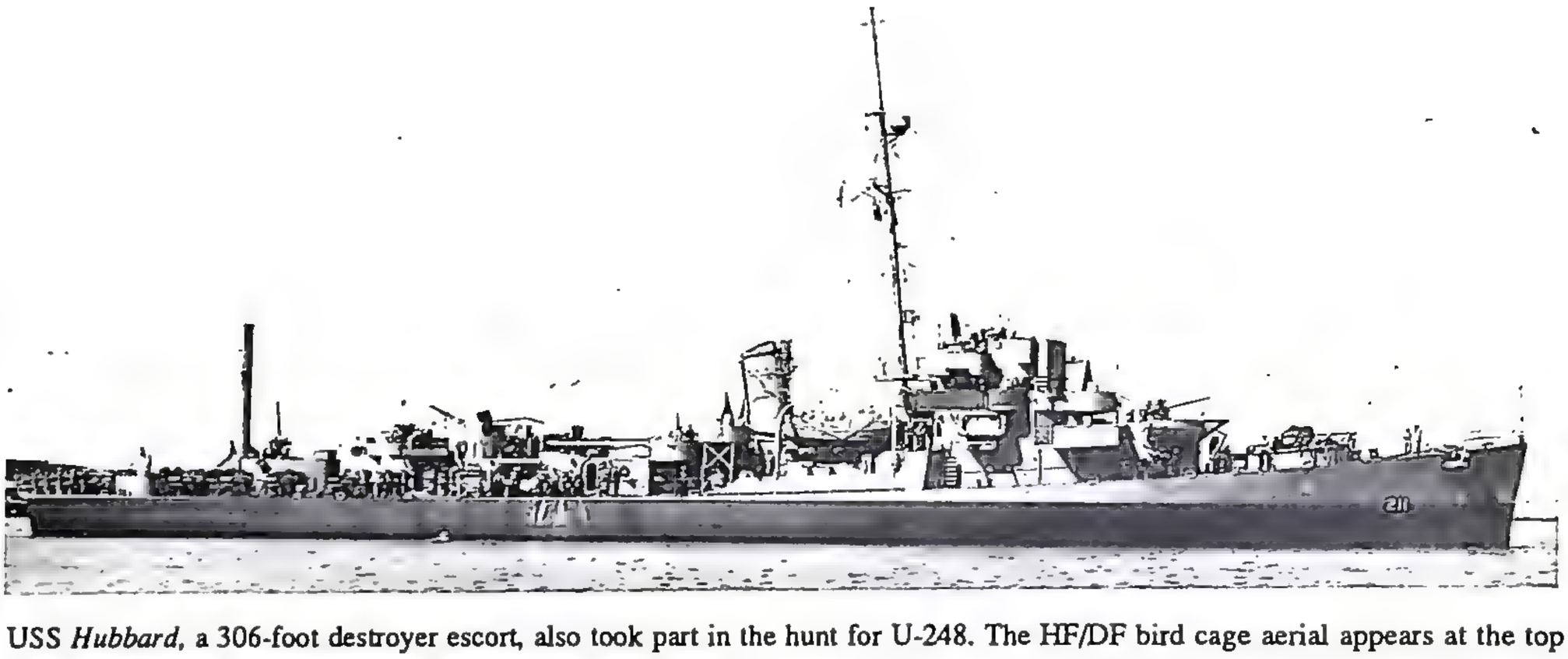
obtained "Class A HF/DF bearings" at 013°T and 003°T, respectively, and concluded that the U-248 was twenty miles from the American warships at 48°45'N 29°12'W. This area was searched with sonar until the morning of 9 January, when the Americans then proceeded to Horta in the Azores for refuelling.[46] The Americans did not know it, but on 7 and 8 January they were sighted by the U-248, and the U-boat fired a torpedo which missed one of the destroyer escorts.[47]

When the three destroyer escorts of TG 22.8 arrived on 10 January at Horta in the Azores, they found the destroyer escort USS *Hayter* at anchor, waiting to join them after a six-day voyage from Boston, Massachusetts.[48] The ships were refuelled, and Bowling held a conference with his captains to discuss the tactics they would employ when the hunt resumed.

For a week TG 22.8 had hunted the U-248 without success. Several times the Americans thought that they had been close to the U-boat, but they were unable to make contact, in part because the number of weather reports transmitted by the U-248 appears to have dropped off.[49] But on 9 January, the BdU ordered the U-248 to "CONTINUE WEATHER REPORTS. THEY ARE

46. "General Narrative," 3, 10.
47. NA, RG 457, SRGN-001-49668, f. 43881.

48. War Diary of USS *Hayter*, 2-10 January 1945 (Naval Historical Center, Washington, D. C.).
49. See NA, RG 457, SRGN-001-49668, ff. 43765-4388.



USS *Hubbard*, a 306-foot destroyer escort, also took part in the hunt for U-248. The HF/DF bird cage aerial appears at the top of her main mast. Photo courtesy of the National Archives.

URGENTLY NEEDED."[50] Bowling and his captains thought that they had to remain "on the stalk for longer than the three or four days permitted by the current fuel consumption." They also felt that they had to obtain "good HF/DF fixes more frequently and regularly," and that they should use "a tactical disposition of the ships which would be optimum for HF/DF purposes." While conducting the search itself, the American ships had to be in radar contact with each other and to maintain good communications between the ships, both to ensure "mobility and efficiency during the search, and . . . [to] expedite converting any contact to a sound contact and attack."[51]

The American officers decided that, in order to save fuel while approaching the HF/DF search area, the destroyer escorts would steam at only twelve knots and that all radar and HF/DF searches would be conducted at the speed of ten knots. The destroyer escorts would advance to the search area in a very wide line abreast formation, covering a front of 180 miles to obtain better HF/DF bearings. In the center of this formation would be the USS *Hubbard*, whose sonar was damaged and out of action but who was equipped with HF/DF, accompanied by the USS *Varian*, whose sonar was working, but who was not equipped with HF/DF. The USS *Otter* would be stationed ninety miles east of the USS *Hubbard* and USS *Varian*, and the USS *Hayter* ninety miles west. All four ships would steam at twelve knots on the same course, thus placing three HF/DF sets on a front of 180 miles to obtain bearings during the advance to the area to be searched. When the four destroyer escorts reached the search area, the four warships would then redeploy into what Bowling called a "Delta" formation (see figure 2 on page 23) for conducting HF/DF searches. This formation was an equilateral triangle, each side being 15.8 miles long. The USS *Varian*, not being equipped with HF/DF, would take up a position inside the triangle at equal distances of nine miles from each of the three corners. The other three destroyer escorts would take up stations at each corner of the triangle. The purpose of this formation was to place the USS *Varian* in radar and/or visual range and also in contact by high-frequency voice radio with the USS *Otter*, USS *Hayter*, and USS *Hubbard* at all times. It was the task of the USS *Varian*, using radar and visual bearings, to keep an accurate plot of the positions of the other three destroyer escorts for the purpose of calculating HF/DF fixes. This triangle formation would form a base line for HF/DF triangulation of about thirteen miles when the bearing was at the least desirable angle. Bowling and his captains thought that this formation would produce the best HF/DF bearings while permitting the most accurate calculation of the fixes possible.[52]

50. NA, RG 457, SRGN-001-49668, f. 43875.
51. "General Narrative," 3.
52. "General Narrative," 4.

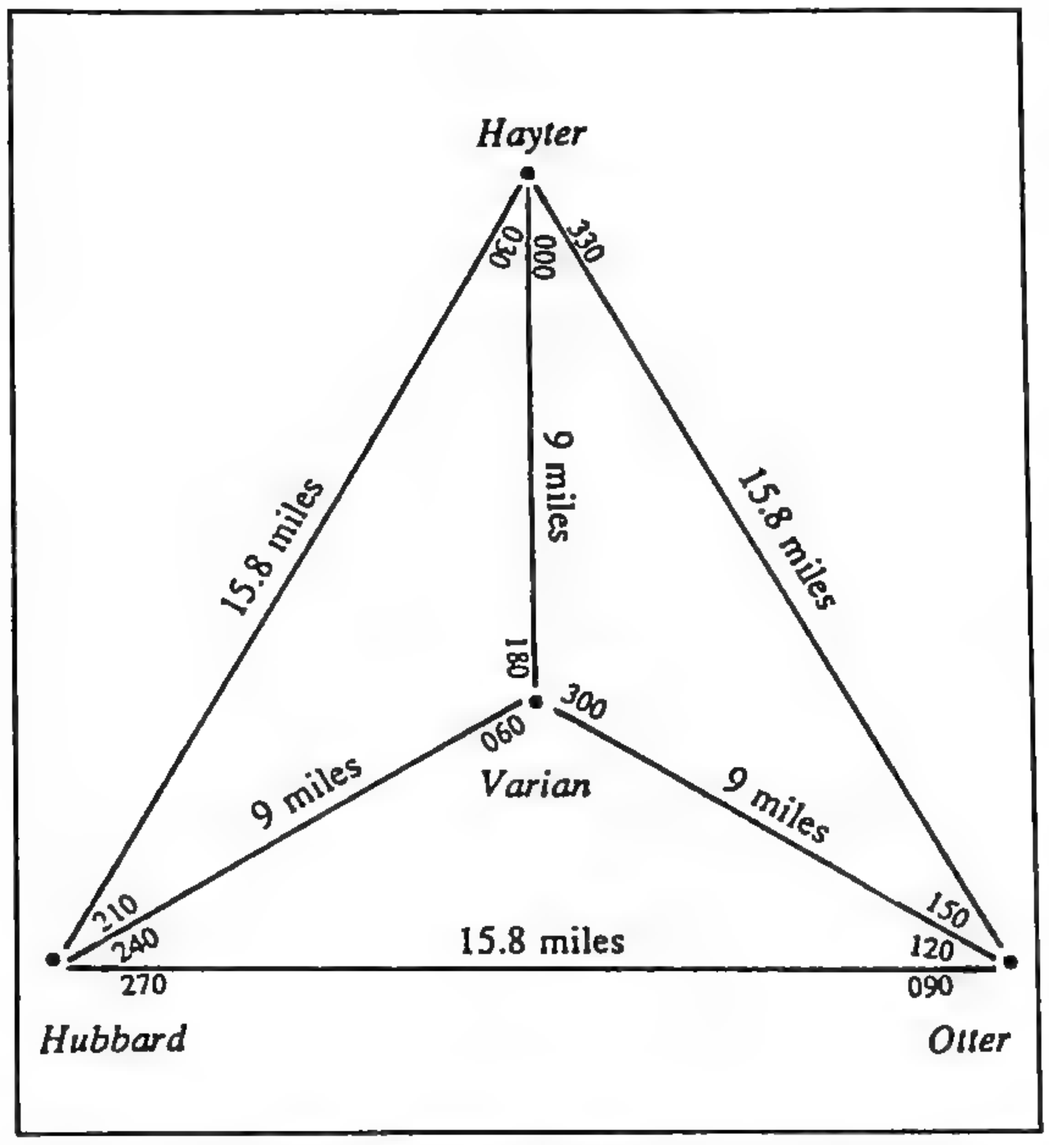


Figure 2: The Delta formation adopted by the vessels in Task Group 22.8 enabled them to calculate the position of U-248. All bearings true.

The Americans also thought that the HF/DF sets on the destroyer escorts were not picking up all the transmissions made by the U-248. The U-248 at times transmitted "just off 54 meters" and "just off 36 meters"[53] and the American HF/DF sets were not calibrated to pick up these "off frequencies." While at Horta the HF/DF sets on the USS *Hayter*, USS *Hubbard*, and USS *Otter* were calibrated to pick up "14 out of 20 off frequencies in the 5 and 8 meg series." This was done by mounting a radio transmitter in a whale boat and calibrating the sets by signals set from that craft. In addition, arrangements were made to guard against more frequencies than could be picked up by a HF/DF set. This was done by running cables from the ship's main radio to the HF/DF area on the ship and the HF/DF "operator standing split phone watch."[54]

At 0220Z on 12 January, TG 22.8 departed from Horta. The American warships formed up in a line-abreast formation to cover a 180-mile front and headed north. Bowling had obtained from the British at Terievira two D/F bearings on the U-248 which placed the U-boat 357°T and 007°T from the Azores. By means of D/F, COMINCH placed the U-248 in the following positions: 0729Z, 48°N 30°W; 1648Z, 47°30'N 29°30'W; and 2328Z, 49°N 27°30'W. However, on the voyage northward the ships of TG 22.8 did not obtain any worthwhile HF/DF bearings.[55]

At 1700Z on 13 January, the American warships made a rendezvous at 47°N 29°W. After the various captains discussed tactics using bullhorns, TG 22.8 formed itself into the "Delta" formation and began to hunt for the U-248 with radar and HF/DF. At 1830Z, a D/F fix was received from COMINCH placing the U-248 at 43°N 29°W, and the course was changed so that the group would sweep over this spot. At 2348Z all three ships obtained HF/DF bearings at 70°T, 74°T, and 77°T, but a fix could not be plotted. A sweep was conducted to the east northeast without result.[56]

The search continued on 14 January. At 0956Z the U-248 transmitted a weather report. Shore-based D/F placed the source of this transmission at 47°30'N 27°00'N.[57] All three destroyer escorts got HF/DF bearing on this transmission at 148°T, 089°T, and 140°T, and they decided to search to the southeast along the two bearings which almost coincided. This search was negative. At 1800Z the USS *Otter* picked up an HF/DF bearing at 350°T, and the American destroyer escorts then conducted a search to the north without result.[58] And then at 0209Z on 15 January, the USS *Otter* and the USS *Hubbard* picked up HF/DF bearings at 205°T and 220°T, and the search was then extended south, again without result. The American destroyer escorts continued to search the area for another day without obtaining any new HF/DF bearings.[59]

At 2229Z on 15 January, the U-248 transmitted a weather report. Shore-based D/F fixes from COMINCH placed the source of this transmission at 47°45'N 27°30'W.[60] After studying this information, Bowling came to the conclusion that the U-248 was east of her normal

53. NA, RG 457, SRGN-001-49668, ff. 43621, 43658, 43711, 43730, 43742, 43769, 43788.

54. "Summary and Recommendations Submitted by CTG 22.8 Pursuant to Operations against Weather Reporting German U-boat Commencing . . . ; Summary of HF/DF Operations while a Unit of Task Group #22.8, period 26 December 1944 to 17 January 1945 (Naval Historical Center, Washington, D.C.).

55. "General Narrative," 6, 10.

56. Ibid., 6, 11.

57. NA, RG 457, SRGN-001-49668, f. 44036.

58. "COMINCH File of Memoranda Concerning U-boat Tracking Room Operations," 2 January 1943 - 6 June 1945, NA, RG 457, SRMN-032, 223.

59. "General Narrative," 6, 11.

60. NA, RG 457, SRGN-001-49668, f. 44089.

station and most likely would move west to regain her station. At 0055Z on 16 January, TG 22.8 began to search to the west.[61] At 0948Z, the U-248 transmitted another weather report "just off 36 meters" which was placed by shore based D/F at 47°30'N 27°00'W.[62] The USS *Otter*, USS *Hubbard*, and USS *Hayter* picked up this transmission on their HF/DF sets with the bearings at 333°T, 012°T, and 339°T. The position of the American ships was 47°33'N 26°34'W (see figure 1 on page 19). The USS *Otter*, USS *Hayter*, and USS *Varian*, in an attack formation, began at 0905Z to conduct a sonar search down a course of 335° to close with the contact.[63]

At 1110Z, the USS *Hayter* obtained a sonar contact at a range of 450 yards bearing 286°T. The contact was classified as a U-boat. It was the U-248. While the USS *Hubbard*, whose sonar was not working, stood off maintaining a radar watch, the other three destroyer escorts of TG 22.8 attacked the U-248. The attacks lasted for some four hours, with the American ships losing sonar contact, then regaining it, and then attacking with hedgehogs and depth charges. At 1305Z, the USS *Hayter* attacked with depth charges, and after the depth charges exploded water "appeared to boil up . . . as though [a] U-boat was blowing tanks attempting to surface." After a depth charge attack by the USS *Otter* at 1317Z, air bubbles and oil appeared on the surface of the sea. Nine minutes later the USS *Otter* again attacked, dropping depth charges on the spot where the oil had appeared on the surface. The Americans saw more oil and air bubbles on the surface after this attack, and they did not regain sonar contact. They sighted debris on the surface, and at 1345Z there were several minor underwater explosions, followed four minutes later by a "violent underwater explosion, very deep such as collapsing of main pressure hull." At 1545Z, the USS *Otter* picked up part of a man's back and other "pieces of human flesh," and then traced the oil slick to its origin and saw oil rising out of the sea "in quantities."[64] This was the end of the U-248.

The destruction of the U-248 at the beginning of 1945 shows why the German U-boat fleet was doomed to defeat at the hands of the Allies. By the end of 1944, the German U-boat service had lost the technological war. The Allies were using the products of advancing technology to sink more and more U-boats by means which the Germans understood barely, if at all. Nowhere was this more true than in the field of electronic warfare. During the Second World War, the Germans were confounded by a number of Allied electronic devices, such as radar, HF/DF, and magnetic anomaly detectors,[65] which were almost impossible for them to counter. In fact, the Germans did not even know of some of the Allied advances in the use of electronic devices in antisubmarine warfare. The sinking of the U-248 is a striking example of the utilization of electronic warfare by the Allies. Specifically, the U-248 was hunted down and sunk because the Germans never understood the great dangers involved in making repeated radio transmissions. Shore-based D/F told the Americans the general location of the U-248. The Germans should have known about the dangers of D/F to a U-boat which made repeated radio transmissions from the same area. The Germans were not aware of shipborne HF/DF, which enabled the American hunters of the U-248 to narrow further the area of the search. And the last weather report sent by the U-248, at 0948Z on 16 January 1945, sealed the fate of the German U-boat, for after intercepting this radio transmission, the task confronting the Americans was one of simply hunting down the U-248 with sonar and destroying it.

61. "General Narrative," 6, 11.

62. NA, RG 457, SRGN-001-49668, ff. 44096, 44117.

63. "General Narrative," 6, 11.

64. "General Narrative," 6-8, 10-12; REPORT OF SINKING OF GERMAN SUBMARINE ON 16 JANUARY 1945. Latitude 47° 36'N Longitude 26° 36' W; Report of findings on pieces of human torso adrift, 17 January 1945 (Naval Historical Center, Washington, D. C.).

65. *Cf.* Montgomery C. Meigs, *Slide Rules and Submarines* (Washington, D.C., 1990).

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The Lasting Injury: The Revenue Marine's First Steam Cutters

ROBERT M. BROWNING, JR.

The quest for technology is as old as mankind itself. History is filled with great inventions and their impact on society. The failures, however, are often forgotten or dismissed. In the 1840s, with steam propulsion increasing in popularity as a method to propel ships, the U.S. Revenue Marine Service built eight steam vessels. Most were built with innovative machinery and propulsion systems. Nonetheless, the building program was a disaster. None of the ships worked well, they were exorbitantly expensive, and all were converted, sold, or transferred to other services within several years of their commissioning. The quest for innovation and progress, in this case, ended in complete failure.

The adoption of steam by the Revenue Marine, a forerunner of the Coast Guard, appeared to be sound. Steamers could perform some tasks better than sailing vessels, making the enforcement of revenue laws easier. Steam propulsion would allow the service to patrol narrow waters better, and vessels with auxiliary power could combat strong currents and unfavorable winds. The department believed that steamers would be useful in the Gulf of Mexico and could help combat smuggling in the Great Lakes, which by the 1840s was being conducted by steamers.[1]

As the Revenue Marine considered building steamers, both the horizontal paddle wheel and the screw propeller had recently been introduced as methods to propel ships. The more unusual method by far was the horizontal wheel. William W. Hunter, a lieutenant in the United States Navy, patented this invention in 1841. The wheels lay horizontal to the bottom of the ship, side-by-side, and moved within drum casings with a vertical shaft. Few blades of the wheel protruded beyond the side of the specially designed bell-shaped hull in order not to push the water around the cylinder — only a two-inch clearance was allowed between the drums and the blades. For war purposes, this idea had merit. The machinery and wheels were not exposed to shot, and the wheels, which lay below the waterline, were not affected by heavy seas as readily as those of side-wheel vessels. Furthermore, according to Hunter, the vessel could be used as an icebreaker since the wheels lay below ice levels in most rivers.[2]

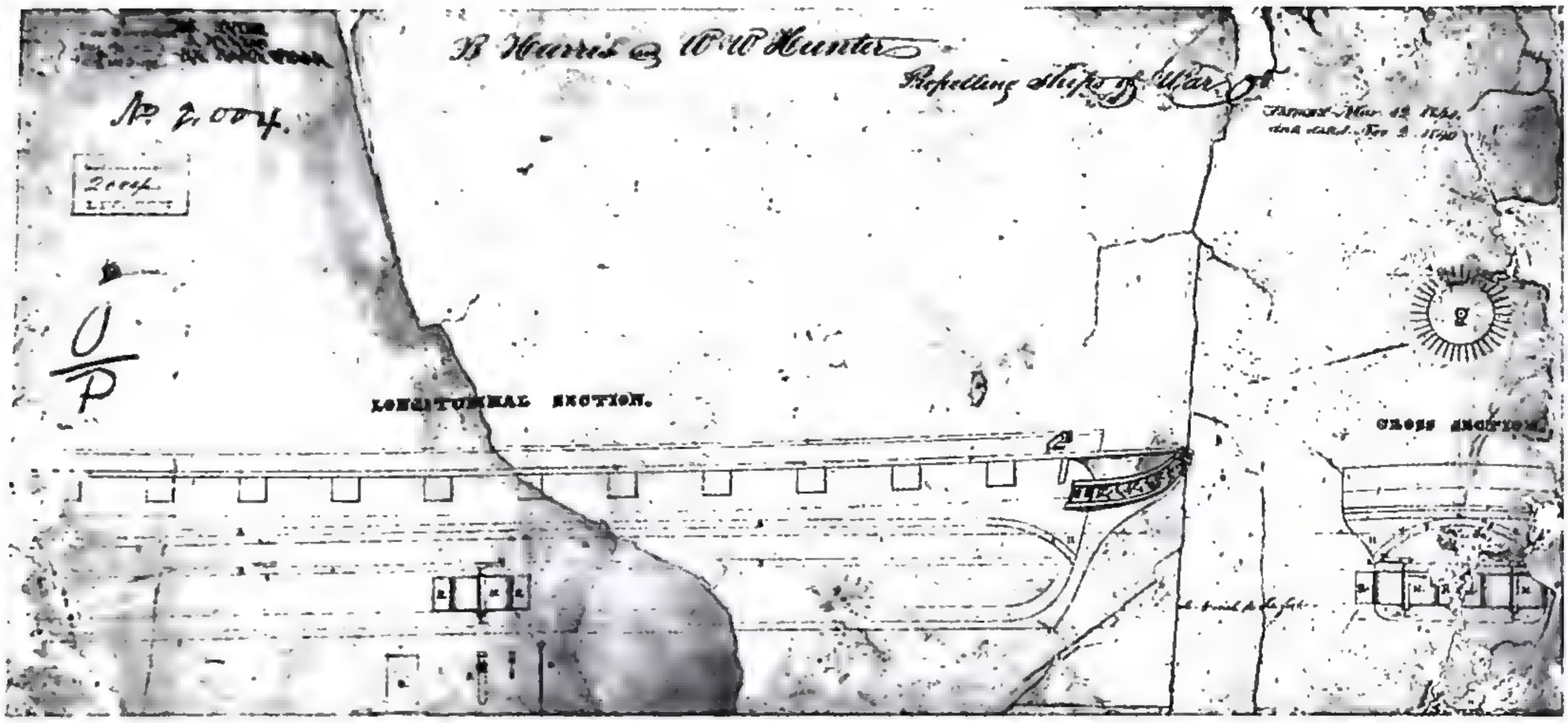
In 1841, Hunter built a small prototype steamer in Norfolk named *Germ*. Fifty-two feet long, eleven feet wide, and drawing only two feet of water, she made over eight knots on her trial trip near Norfolk. Hunter took her to the Great Lakes and then to Baltimore, demonstrating her capacity to serve along the coast and in the interior waters. She became the first steamer to pass from the Atlantic to Lake Erie via the canals and return to the East Coast.[3]

These trials impressed a large number of people. The Commandant of the Norfolk Navy Yard, William B. Shubrick, said that the vessel was ". . . among the greatest triumphs of American genius." Hunter offered his invention to the Revenue Marine Service in December 1841, arguing that it "would be economical and usefully employed . . . ." He claimed that a small steamer similar to *Germ* could be built for $4,500, would use only five

1. The Revenue Marine considered building steam cutters as early as 1838. See *Army and Navy Chronicle* 7, no. 23 (6 December 1838); Captain Alexander Fraser to Secretary of the Treasury John C. Spencer, 9 January 1844, as cited in Horatio David Smith, *Early History of the United States Revenue Marine Service (or United States Revenue Cutter Service) 1789-1849* (Bryn Mawr, PA: R.L. Polk Printing Company, 1932), 58.

2. Patent Number 2,004, 12 March 1841, copy, Manuscript Department, Tulane University; Frank M. Bennett, *The Steam Navy of the United States* (Pittsburgh: Warren and Company Publishers, 1896), 48; Hunter to Secretary of the Navy Abel Upsher, 26 February 1843, in *William Hunter to Naval Committee of Senate and House* (26 February 1843), 27th Cong., 3d sess., S. Doc. 244, 7.

3. H. A. Musham, "Early Great Lakes Steamboats: The First Propellers 1841-1845," *The American Neptune* 17 (April 1957):91.



Lieutenant William W. Hunter's original 1840 patent drawing shows his invention, the horizontal submerged wheel. Photo courtesy of the U.S. Coast Guard Historian's Office.

dollars' worth of fuel a day, and could be run by two or three men. Secretary of the Treasury Walter Forward answered Hunter four days later, telling him that the department had no interest.[4]

Undaunted, Hunter convinced the Navy Department of the usefulness of his invention, and the Navy built the steamship *Union*, commissioning her in early 1843. The Navy also contracted for the building of the iron-hulled gunboat *Michigan* for the Great Lakes, laying the keel in 1842. The Navy's progress with these ships elicited interest in the new technology from other government agencies. In February, the new Secretary of the Treasury, John C. Spencer, instructed Captain William A. Howard to prepare two models for iron-hulled steam revenue cutters.

Iron-hulled steamships had definite advantages in a service in which the vessels saw much active duty. Captain Howard determined that iron hulls would not rot or sustain damage from marine borers, that they would be stronger than wood, and that repairing them would cost 50 percent less than repairing wooden ships of the same size over a twenty-year period.[5]

Howard also scrutinized several propulsion systems. He favored the screw propeller system of Swedish inventor John Ericsson. Ericsson's propellers had six blades. Each blade had a helicoidal twist and was supported by a cast brass hub. A copper band around the blades gave additional support. By 1843, at least forty-five vessels had already adopted Ericsson's screw.[6]

On 17 April, the department advertised its intention to build steamships. The estimated cost was less than $50,000, and the builders had five months to deliver the engines and six months for the hulls. Three days later, Howard hastily offered Hunter and Ericsson contracts for their propulsion systems to be placed in steamers of approximately four hundred tons.[7]

4. Shubrick to Hunter, 29 May 1841, Construction and Repair Proposals, Entry 199, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D. C. (Hereafter this National Archives Record Group will be cited as NA, RG 26, and entries as E.) John M. P. McLaughlin to Hunter, 24 March 1845, Hunter to Forward, 13 December 1841, E 199, NA, RG 26; Forward to Hunter, 17 December 1841, Letters Sent, E 143, NA, RG 26.

5. Howard to Forward, 31 January 1843, First Lieutenant Douglas Ottinger to Charles Kelso, 5 January 1843, Letters from Officers of Cutters, E 151, NA, RG 26; Spencer to Howard, 24 March 1843, E 143, NA, RG 26; Register of Officers, NA, RG 26.

6. Bennett, *Steam Navy*, 63; Robert H. Thurston, *A History of the Growth of The Steam Engine*, International Scientific Series, vol. 24 (New York: D. Appleton and Company, 1893), 297; William Conant Church, *The Life of John Ericsson*, 2 vols. (New York: Charles Scribner's Sons, 1890), 1:110.

7. Advertising Proposals in *New York Herald*, 17 April 1843, Letters Received, E 146, NA, RG 26; Spencer to Hunter, 20 April 1843, E 143, NA, RG 26; C. S. West to Thomas Corwin, 9 October 1852, E 199, NA, RG 26.

The department signed contracts for six vessels, four on Hunter's patent, *Spencer*, *Bibb*, *Dallas*, and *McLane*, and two with Ericsson's screw propeller, *Legare* and *Jefferson*. The six ships were to be as similar as possible, built on similar plans, with the same boilers and nominal horsepower. Ericsson quietly told Spencer that he intended to deviate from the department's plan by building the cylinder to require about fifty pounds of pressure, which would generate the horsepower stipulated. Ericsson built cylinders that measured thirty-six inches in diameter with a two-foot, eight-inch stroke, while Hunter's measured twenty-four inches in diameter and had a three-foot stroke.[8]

On 4 May, Spencer appointed Captain Howard to superintend the construction of the new vessels. This appointment placed Howard in an awkward position. Spencer had created the position of Chief of the Bureau in order to centralize control, appointing Captain Alexander Fraser to this position. Eleven years earlier, Fraser, who was now chief, had been Captain Howard's second lieutenant on board the revenue cutter *Alert*.[9] Now Howard would have to report to Fraser in matters regarding the construction of the steamers.

Howard showed some reservations about Hunter's wheel. He suggested changes and considered Hunter unqualified to direct the building of the ships. On 23 May, Howard boarded *Union* for a trial cruise. In smooth water she made about nine knots and sailed "remarkably fast both under canvas and steam." At the end of the day, Howard was a new convert to the Hunter wheel. During the trial, Hunter and Howard talked candidly and agreed that the vessel had some faults, particularly in the boilers, but concluded that alterations in the revenue cutters would be possible. "Fully convinced" of the soundness of the horizontal wheel, Howard wrote to Spencer that he would "proceed to build the four vessels . . . with all possible despatch."[10] Howard's new-found enthusiasm for the Hunter wheel would be something that he and others would regret for decades.

With the Treasury Department's approval, Lieutenant Hunter began making alterations in the dimensions and arrangements of engines and hulls. Meanwhile, Spencer reminded Howard that Lieutenant Hunter's directions were to be followed, thus relegating Howard to a position in which he merely saw that the materials were of the "proper quality and that the workmanship . . . [was] faithfully performed." Hunter arrived in New York in mid-July with a new model and concluded that the proposed changes were "great improvements."[11]

Howard's enthusiasm for Hunter's invention waned once the construction commenced. Howard began suggesting changes, but the new Secretary of the Treasury, George M. Bibb, felt that if the department deviated from Hunter's plans, Hunter might "divest" himself of the responsibility and "transfer the accountability" onto the Treasury Department if the ships failed.[12]

During the winter and spring, Howard chafed under Hunter's tutelage but remained busy traveling from city to city in an attempt to supervise the construction of the ships. Hunter's *Spencer* and Ericsson's *Legare* were the first two ships to be completed, and the department decided to test both models to determine which method of propulsion was better. During the final stages of construction, and before trials were held, Howard began to speak publicly in favor of Ericsson's steamer *Legare*. Hunter protested Howard's actions, and Secretary Bibb removed the captain from supervision of *Spencer*. Bibb placed Captain Fraser in command of *Spencer* in order to ensure a fair trial.[13]

Before *Spencer* was completed, *Legare* raced the British side-wheeler *Great Western*. On 20 July 1844 *Legare*, with her sails furled, and *Great Western*, with hers set, raced eighteen miles from New York to Sandy Hook. The *Great Western*, with a half-mile head start and the aid of her sails, finished one mile behind *Legare*.[14]

Legare had proved she was ready for her trials and had made "repeated" tests while *Spencer* lay idle. Therefore, once *Spencer* was ready, Fraser permitted Lieutenant Hunter to test his machinery before both vessels were tried together. During the month of August, *Spencer* ran up and down the Hudson River at about six knots but experienced problems with her shafts, which

8. Spencer to Hunter, E 199, NA, RG 26; Ericsson to Spencer, 12 April, 24 April 1843, E 146, NA, RG 26.

9. Spencer to Howard, 4 May 1843, Spencer to Fraser, 12 April 1843, E 143, NA, RG 26; Stephen H. Evans, *The United States Coast Guard 1790-1915: A Definitive History* (Annapolis: Naval Institute Press, 1949), 35.

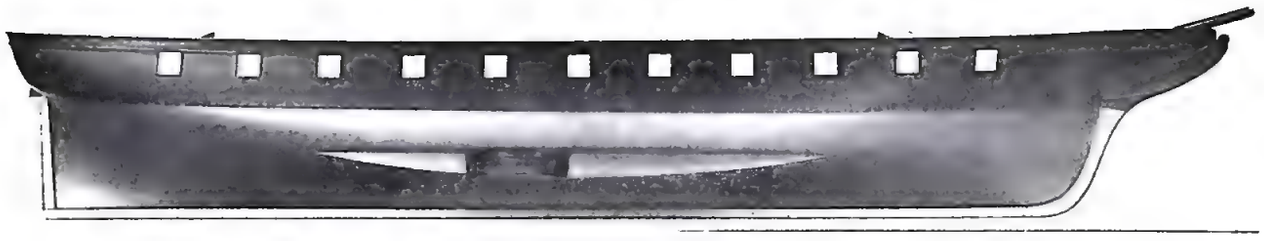
10. Hunter to Spencer, 5 May 1843, E 146, NA, RG 26; Spencer to Howard, 9 May 1843, E 143, NA, RG 26; Howard to Spencer, 2 May 1843, E 151, NA, RG 26; Howard to Spencer, 23 May, 1 June 1843, E 199, NA, RG 26.

11. Spencer to Howard, 8 July 1843, E 143, NA, RG 26; Howard to Spencer, 15 July 1843, 26 July 1843, E 151, NA, RG 26.

12. Bibb to Howard, 1 November 1844, E 143, NA, RG 26.

13. Spencer to Howard, 9 January 1844 passim, Bibb to Howard, 30 July 1844, McClintock Young to Fraser, 29 May 1844, Bibb to Fraser, 14 August 1844, E 143, NA, RG 26; Hunter to Young, 8 May 1844, E 151, NA, RG 26.

14. Evans, *United States Coast Guard*, 46-47.



This half model of a Hunter wheel vessel shows the position of the horizontal wheel. The half model is currently at the Smithsonian Institution. Photo courtesy of the U.S. Coast Guard Historian's Office.

caused the wheel wells to fill with water. Replacing one of the shafts took nearly four weeks.[15]

In September, Captain Fraser ordered the two steamers to hold trials running from New York Harbor up Long Island Sound. On a twenty-mile course, *Spencer* steamed no faster than she had on her shakedown cruises, and Ericsson's *Legare*, traveling at about seven knots, beat her by forty-one minutes. After several days of tests the ships headed south again, *Spencer* having consumed about one thousand pounds of coal each hour during the last leg of the trip.[16]

Captain Fraser realized immediately that *Spencer* needed major alterations. During the trials, several parts of the machinery wore out, the boiler and the throttle valve worked improperly, and the brickwork arches in the boiler settled. Hunter claimed that improvements could be made, but these trials convinced the department that steamships with submerged wheels and propellers were not as useful as ordinary sailing vessels.[17]

During the trials, *Spencer* had proved to be unstable under sail. Secretary Bibb asked Howard to make alterations to improve the Hunter-built ships. Fraser suggested that the masts of *Spencer* be reduced, along with the spars and canvas, "to insure the ship's safety." After some study, Howard reported that "there is no alteration that will increase her speed . . . ."[18]

By the fall of 1844, both Fraser and Howard realized that Hunter's vessels were failures. Allowing the designers of the engines to design the hulls as well proved to be a major mistake, as was permitting Lieutenant Hunter to make alterations on the wheels and machinery of his vessels. Howard felt he could no longer sit idle, and he began an immediate and personal campaign to interfere with the construction of the unfinished vessels. Shortly after the trials, he began to lobby for the conversion of the Hunter wheel steamers to side-wheel propulsion. Howard also intervened directly in the construction of *George M. Bibb* and had work discontinued on *Dallas* until spring, ostensibly because of the winter weather.[19]

While the fate of the Hunter wheel vessels hung in the balance, *Legare* steamed to Key West for revenue duty under Captain Henry B. Nones. Nones was reminded to conserve fuel and to rely "mainly upon the canvas . . . ." Nones started the trip with enthusiasm, but in less than three weeks his opinion of *Legare* had changed tremendously. He complained that she was over-sparred and feared that the boiler would burst. The engines had so little power that Nones stated that if he was "so unfortunate to be caught on a lee shore, even in a moderate gale, I must inevitably be lost . . . ."[20]

Spencer operated along the East Coast during the winter and experienced many difficulties. The boiler leaked severely after only three months' service. The vessel had no bilge pump amidships, which forced the men to bail and hoist scores of barrels of water out of the hold. In heavy seas and bad weather, this was impossible. In February, *Spencer* was tasked to steam to the assistance

15. Bibb to Howard, 30 July 1844, Bibb to Fraser, 14 August 1844, E 143, NA, RG 26; *Spencer* Log, 23 August 1844 passim, NA, RG 26.

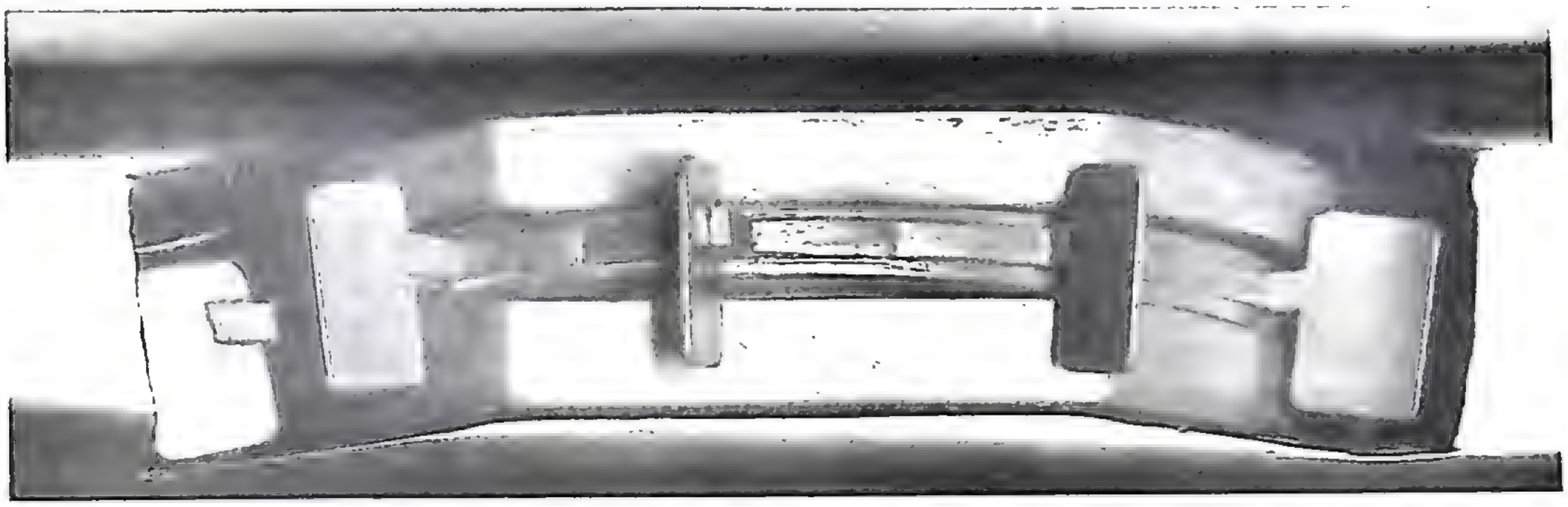
16. Smith, *Early History*, 64; *Spencer* Steam Journal, NA, RG 26.

17. William Wood to Fraser, 1 October 1844, attached to *Spencer* Log, 1 October 1844, NA, RG 26; Bibb to Senate, 2 January 1845, E 143, NA, RG 26; Charles H. Haswell to Hunter, 14 October 1844, Hunter to Bibb, 15 October 1844, E 151, NA, RG 26.

18. Bibb to Howard, 19, 31 October 1844, Fraser to Secretary of the Treasury, 1 October 1844, E 199, NA, RG 26; Howard to Bibb, 30 October 1844, E 151, NA, RG 26.

19. Howard to Bibb, 21 October 1844, Bibb to Howard, 24, 30 October 1844, E 143, NA, RG 26; Fraser to Secretary of the Treasury, 1 October 1844, E 199, NA, RG 26.

20. Bibb to Nones, 26 October 1844, E 143, NA, RG 26; Nones to Bibb, 6, 25 November 1844, E 151, NA, RG 26.



This close-up of the half model shows the outboard features of Hunter's horizontal wheel. Photo courtesy of the U.S. Coast Guard Historian's Office.

of vessels gone ashore off Barnagat Beach, but a month later a board of officers condemned her and suggested propellers as an alternate source of propulsion.[21]

With *Spencer* a proven failure, Howard again began to deprecate Hunter and his invention. Fraser also expressed his negative views on *Bibb*, then being built in Pittsburgh. The machinery occupied forty feet of the midships section of the steamer, which complicated the placement of the coal bunkers and the masts. It took up so much space that, in order to leave room for fuel, the accommodations for the captain were placed on the spar deck. Fraser pointed out to the Secretary of the Treasury that two vessels of similar size being built for the Mexican government in New York had only twenty-six feet of machinery space.[22]

Howard, who had pleaded for a change in propulsion, became desperate for some action and exceeded his authority. In October 1844, he had recommended to Secretary Bibb that *McLane* be changed to side-wheel propulsion. If done before completion, such a change would cost $4,000. Secretary Bibb responded in mid-February 1845 that a great sum of money had been spent on Hunter's plan and that he intended to try it fairly before condemning it and making another "large outlay . . . for alterations."[23] The secretary, however, left office, and Howard took advantage of this change to take Hunter's wheels out of *McLane*. In April, less than a month after the change in secretaries, Hunter informed the department that the wheels had been taken out of the steamer and that the sides had been planked over. The new Secretary of the Treasury, Robert Walker, asked for an "explicit and immediate explanation."[24]

Howard answered that he had been anxious to change the propulsion of *McLane* before the department spent large sums of money on launching her and then hauling her out of the water. Howard further explained that he had corresponded with Bibb while in Washington, and that he "considered such the intentions of the department."[25]

Walker immediately wrote back to Howard that "You have repeatedly been instructed in the most positive manner, by written order, and verbally by Captain Fraser as Head of the Bureau, that the mode of propulsion must not be changed until the vessel had been tried on the Hunter plan." He added that "The removing of wheels and planking up the vessel was a high-handed act, without the least shadow of authority which I must look upon as an assumption approved on your part which you must never repeat." Walker listed the written orders of five different dates which had detailed the department's stance. He ordered *McLane* to be launched without delay and withdrew Howard from overseeing *Spencer* so he could give his complete attention to *Bibb*.[26]

Howard had also expressed his views that *Bibb* should be altered, but Secretary Walker would not permit any alterations until Hunter had a chance to test her. Launching *Bibb* on 10 April 1845, Howard continued attacking Hunter's mode of propulsion. On 8 May, the department relieved Howard of command and ordered Captain Winslow Foster to *Bibb* to ensure a fair trial. The order "was not obeyed" by Foster because the steamer was

21. William Luke to H. D. Hunter, 23 January 1845, E 199, NA, RG 26; Howard to Bibb, 3 March 1845, Howard to Secretary of the Treasury Robert Walker, 10 April 1845, E 151, NA, RG 26; Walker to Howard, 8 May 1845, E 145, NA, RG 26.

22. Fraser to Walker, 30 May 1845, E 151, NA, RG 26.

23. Bibb to Howard, 24 October 1844, E 143, NA, RG 26; Howard to Bibb (n.d.) and enclosure Jabez Coney to Bibb, 4 February 1845, E 146, NA, RG 26; Bibb to Howard, 15 February 1845, E 143, NA, RG 26.

24. Walker to Howard, 4 April 1845, E 143, NA, RG 26.

25. Howard to Walker, 10 April 1845, E 151, NA, RG 26.

26. Walker to Howard, 14 April 1845, E 143, NA, RG 26.

not ready, and Howard remained in command. Lieutenant Hunter prepared *Bibb* for trial and, satisfied with the engines, took her down river on 24 June.[27]

The trial was a farce. The pressure in the boilers, which were designed for sixty pounds, could not be maintained, was never raised over forty pounds, and fell as low as ten. *Bibb* developed a major leak and, with five feet of water in the hold, had to be hauled on a beach to prevent sinking. An examination showed that the packing around the starboard wheel shaft was entirely gone. On her trip, she had run about seven knots with the current.[28] After this failure, Howard towed *Bibb* to Cincinnati. Under the pretense that low water levels made it necessary to keep her there, he had her changed to side-wheel propulsion.

Hunter claimed that "without any authorization from the department, [Howard] took out Hunter's propellers and substituted side wheels" on *Bibb*. But no evidence substantiates Hunter's claim. On the contrary, in October Walker instructed Howard that the openings in her sides were to be filled in without disturbing the wheel casings.[29]

Before the Treasury Department discovered the numerous flaws of these six faulty steamers, it began to look into the possibility of building two side-wheel steamers using proven technology. The need for these vessels was immediate. The Revenue Cutter Service had been tasked to protect timber under an act of Congress in 1822. For twenty years, thieves in Louisiana and Florida had been stealing live oak and cedar timber. During the fall of 1844, Naval Constructor Samuel Humphreys and Fraser discussed building a shallow-draft, iron-hulled, two hundred-ton sail-and-steam revenue cutter for inland navigation.[30] The department eventually built two vessels, but of much larger dimensions — too large to be used in the inland waterways. Contracts were let in December 1844 and January 1845. Unfortunately, building these steamers would only compound the department's mistakes.

Because of the problems with the first three Hunter's wheel vessels, the department suspended work on *Dallas* in November 1844 until it could determine if the mode of propulsion and hull form should be changed. *Dallas*, being built at Buffalo, was destined for service on the Great Lakes. The supervising officer, First Lieutenant Douglas Ottinger, had served on the lakes and on *Legare*. In his opinion, *Dallas* drew too much water and had a high center of gravity. Ottinger thought side wheels would be much better suited for use on the lakes. But Secretary Walker insisted that *Dallas* be completed according to the original plans, Ottinger's suggestions notwithstanding. Alterations costing $10,000 were already under consideration. These included adding a stuffing box on the shaft, strengthening the arms of the paddle wheel, and adding false sides or blisters to give the vessel added stability.[31]

The department delayed making any decision on *Dallas* until a conversion of two of Hunter's other failures, *Spencer* and *McLane*, was complete. The *McLane* was to be converted to a side-wheeler, and *Spencer* would be fitted with two Loper propellers. Invented by Captain Richard L. Loper, a Philadelphia shipbuilder and shipping magnate, these propellers later became extremely popular on other steamships. They were less complicated than Ericsson's and had proved to be reliable. Cogged gears were added to the power trains of both vessels to speed up and transform the motion into different directions than had been intended originally. Both ships had two high-pressure noncondensing horizontal engines, twenty-four-inch cylinders, a three-foot stroke, and a boiler with just under fifteen hundred square feet of heating surface. *Spencer*'s propellers each had four blades eight feet in diameter that made one and one-fourth revolutions for each revolution of the engine. *McLane*'s side wheels were sixteen and one-half feet in diameter with fourteen buckets on each wheel and made sixty-five revolutions for each hundred of the engine.[32]

In February, Secretary Bibb ordered Howard to superintend the conversion program and to oversee the alteration of *Spencer*, the first twin-screw iron steamer in government service. The trials, to determine differences of speed, fuel consumption and other qualities, were delayed several times due to mechanical problems. The first trial

27. Walker to W. W. Hunter, 8 May 1845, E 199, NA, RG 26; Walker to Howard, 5 July 1845, E 143, NA, RG 26; Register of Officers, s.v. Winslow Foster; Letter 5 September 1850, Memorandum relating to Captain Howard on Leaving Pittsburgh in Iron Steamer *George M. Bibb;* NA, RG 26; C. S. West to Thomas Corwin, 9 October 1852, E 199, NA, RG 26.

28. *Bibb* Steam Journal, 23, 24 June 1845, NA, RG 26; *Bibb* Log, 10 June, 24-26 June 1845, ibid.

29. "In the matter of the claim of Lieutenant William W. Hunter," 12 October 1852, E 199, NA, RG 26; Walker to Howard, 20 October 1845, E 143, NA, RG 26.

30. *Statutes At Large*, 17th Cong., 1 sess., Chapter 9, tab 23, 1822; U.S. Congress, Senate, *Report From the Secretary of the Navy*, 27th Cong., 3d sess., S. Doc. 97, 2-3; Samuel Humphreys to Charles Morris, 23 October 1844, Note of Captain Fraser (n.d.) passim, Subject File AD, Design & General Characteristics 1860-1910, Naval Records Collection of the Office of Naval Records and Library, NA, RG 45.

31. Howard to Bibb, 3 March 1845, Ottinger to Walker, 28 May, 10, 24 June, 10 July 1845, Charles French to Walker, 10 July 1845, E 151, NA, RG 26.

32. Alex V. Fraser, "Report of Trial of the Revenue Steamers 'Spencer' and 'McLane,'" *Journal of the Franklin Institute* 12, 3d series, no. 3, (September 1846):169-170; U. C. Perry, Charles Haswell, to Charles Morris, 18 May 1846, Executive Correspondence, E 156, NA, RG 26.

of *Spencer* occurred on 22 May, but leaking boilers and wheel casings and loose joints around the keel caused so many problems that Fraser hauled her on the ways on 28 May.[33] On 30 May, trials were again held on board *Spencer* to determine the success of the conversion, and she steamed at nearly nine knots.

Spencer's conversion did not solve her myriad problems. The machinery was amidships but the propellers were in the stern of the vessel, making it necessary to install shafts of great length to reach from the midships engine room to the stern. Six bearings supported the shaft, which increased friction and decreased efficiency. The engine room was too small, but still occupied fifty feet of the vessel. Even with the removal of the captain's quarters to the spar deck, this still allowed only six days' fuel to be carried. The boilers continued to foam, the engines could burn one ton of coal an hour, and the temperature in the engine room frequently reached 130°. For six months the officers adjusted her machinery and fought leaking boilers in an attempt to make her functional. On a positive note, the Loper propellers proved to be much better than Hunter's wheels. They did three times more work with 60 percent of the power and were over four-and-a-half times more efficient using fewer revolutions and less boiler pressure.[34]

The side-wheel steamer *McLane* also had numerous problems. Under the command of Revenue Captain Henry Hunter, she could make nearly eight knots but the boilers could not maintain forty pounds of steam and usually could carry only twenty to twenty-five pounds. Moreover, the exhausted steam flowed into the wheel housings and streamed along the deck. This made navigation difficult by preventing the helmsmen from seeing the length of the vessel.[35]

In April 1846, the service held four trials between *Spencer* and *McLane* in Long Island Sound. Some felt that the trials were more confusing than enlightening. They did confirm that *McLane*'s engines with side-wheel propulsion were 50 percent more efficient than *Spencer*'s with Loper propellers. They also demonstrated that neither vessel sailed well under canvas and, according to Alexander Fraser, "clearly exhibit to practical men; that, speed under steam, or stability under canvas, are unattainable objects."[36]

With steamers that burned fuel so rapidly, the Revenue Marine now faced a new logistical challenge. The Service established coaling depots at the major cities but had problems keeping them supplied. The depots frequently ran out of coal, and many times the captains substituted wood as fuel. Anthracite coal was best adapted for the steamers, but bituminous was also used. Some of the depots did not accommodate steamers with deep drafts. In Boston it took days to coal a cutter because she could not remain at the wharf longer than two and one-half hours at each tide due to the shallow water there.[37] The great quantity of fuel that these vessels consumed made it difficult to keep their bunkers filled.

The department instructed all captains to use canvas as much as possible to economize on fuel. Steam was to be used in cases of emergency and when absolutely necessary. These instructions were rarely followed. Captain Henry B. Nones was reprimanded by Secretary Bibb for his "use of steam in nearly every movement of the *Legare*." This practice worsened the logistical problems and compromised the vessels' sailing qualities, since most of the coal was stored at either end and above the waterline. Using great amounts of coal altered their trim quickly, making it necessary to replenish coal supplies frequently to keep the cutters stable.[38]

Shortly after the trials of *Spencer* and *McLane*, the United States declared war on Mexico. On 19 May 1845, Secretary Walker ordered that the Revenue Marine protect the Gulf Coast. Eleven cutters sailed to rendezvous in New Orleans. In mid-May, both *Spencer* and *McLane* loaded with stores and ammunition and proceeded to sea. *Spencer* steamed to Charleston, but her boilers failed three days out of that port, and she had to return. After cooling the boiler, Captain Caleb Currin found that it could not be repaired. Therefore, on 24 July, *Spencer* set sail for Philadelphia.[39]

33. Bibb to Howard, 17 February, 22 February 1845, E 143, NA, RG 26; Evans, *The United States Coast Guard*, 50; Bibb to Howard, 22 February 1845, E 143, NA, RG 26; *Spencer* Log, 8 February, 14, 23, 28, 30 May, 1845, NA, RG 26.

34. Fraser to Walker, 30 May 1845, E 151, NA, RG 26; *Spencer* Steam Journal, 20, 22 May, 19 June 1845, *Spencer* Log, 20, 22 May, 19 June 1845 passim, 12 January 1846, NA, RG 26; "William Hamilton Loper's Propellers and Hunter's Submerged Wheels," *Journal of the Franklin Institute* 11, 3rd Series, no. 1 (January 1846):24-26.

35. *McLane* Log, 17, 18 December 1845, NA, RG 26; H. D. Hunter to Secretary of the Treasury, 19 December 1845, E 151, NA, RG 26.

36. Perry, Haswell to Morris, 18 May 1846, E 156, NA, RG 26; Fraser to Walker, 12 May 1846, E 151, NA, RG 26.

37. Young to Howard, 31 May 1844, E 143, NA, RG 26; *Bibb* Log, 22, 23, June 1847, *Walker* Log, 30 January 1848, NA, RG 26; Ericsson to Spencer, 1 March 1844; Hunter to Walker, 10 December 1843, Howard to Walker, 8 September 1845, E 151, NA, RG 26.

38. Bibb to Nones, 27 February 1845, E 143, NA, RG 26; Winslow Foster to Walker, 18 May 1847, E 151, NA, RG 26.

39. Evans, *The United States Coast Guard*, 60; *Record of Movements: Vessels of the United States Coast Guard 1790-December 31, 1933* (Washington D.C.: Coast Guard Headquarters, 1935), 108; Currin to Walker, 3, 17 June 1846, E 151, NA, RG 26.

McLane, commanded by Howard, set sail on 27 May for the Gulf Coast. Her boilers were nearly useless, and she could make only two-and-one-half to three knots per hour. On the way south, Howard stopped in North Carolina to make repairs and wrote to Walker to apprise him of the difficulties. Walker, seething from all the problems associated with these steamers, responded:

> Experience has long since convinced this department of the entire failure of these vessels to meet its reasonable expectations. Expectations founded chiefly on your own assurances and representations before their construction was commenced. . . . Having therefore been mainly instrumental in inducing the adoption of plans, in which all rules of Naval Architecture as well as mechanics are denied, it is but just that the opportunity should be afforded to you to realize by practical experience the lasting injury which has thus been inflicted upon the service as well as the injustice which has been done to the Government.[40]

After making repairs, *McLane* limped south and arrived at Belize on 5 June. A week later, she went to New Orleans for boiler repairs. It took her over forty hours under constant steam to get there, and after the trip, Howard wrote that *McLane* would be of no use except "as a (floating) battery." In this condition she was virtually useless to the Navy and could not even carry troops. Her draft precluded her from all harbors west of New Orleans except Galveston. During her Mexican service she never averaged over five knots, and Howard commented that, lacking power, if she were caught on a lee shore in an ordinary gale of wind, she "must . . . go ashore." For several months *McLane* lay moored in the river in the Gulf of Campeche near Frontera due to defects in her machinery, where she could not "have escaped had an attack been made." *McLane* operated in a crippled state with the Navy until December 1847, when Howard was directed to take her to New Orleans to be dismantled.[41]

Legare, in Charleston when the war began, was ordered to the Gulf of Mexico to cooperate with the Navy. She had been the most successful steamer to date, although she had also experienced numerous problems. Her boiler had never been sufficient, and she had received a forced draft blower to help increase steam. In October 1844 she steamed to Key West, but in less than six months her engine and boiler needed extensive repairs. The boiler leaked five hundred gallons an hour, and Captain Henry Nones kept her anchored most of the time until June 1845, when she was ordered to Philadelphia for repairs. Here her Ericsson propellers were exchanged for Loper's propellers.[42]

Legare steamed back to the Gulf and arrived on 7 August 1846. She immediately developed a leak. Captain Napoleon Coste requested that either the engine be repaired or the propeller be taken off because, when inoperable, its drag made him fear for the safety of the vessel. The Navy used *Legare*, carrying one long 18-pounder and several smaller guns, as a dispatch boat during the war. After only two months of service, the leaks in her boiler could no longer be caulked. Her further use was "dangerous," and she was ordered back to Norfolk.[43]

At the outbreak of war, the two side-wheel vessels were nearing completion. *Polk*, built in Richmond, was a side-wheel steamer of about four hundred tons. Over two years had passed since the laying of her keel, and Secretary of the Treasury Walker was anxious that she be completed. In December 1846, Revenue Captain Henry Hunter, who supervised her construction, claimed that she would be ready in February. The delays caused "much surprise" for Walker, who thought her nearly ready for sea. Hunter blamed the delay on the weather, the lack of coppersmiths to work on the engines, and the Christmas holidays. During the months of January and February, over eighty mechanics were employed getting *Polk* ready for sea.[44]

Polk was finally turned over to the Navy in mid-March 1847, Lieutenant William S. Ogden commanding. On 31 March, *Polk* stood out to sea but leaked so badly on the trip to the Gulf of Mexico that she anchored at Ocracoke Inlet. Finding the sponsons under her guard had not been properly fastened, Ogden took

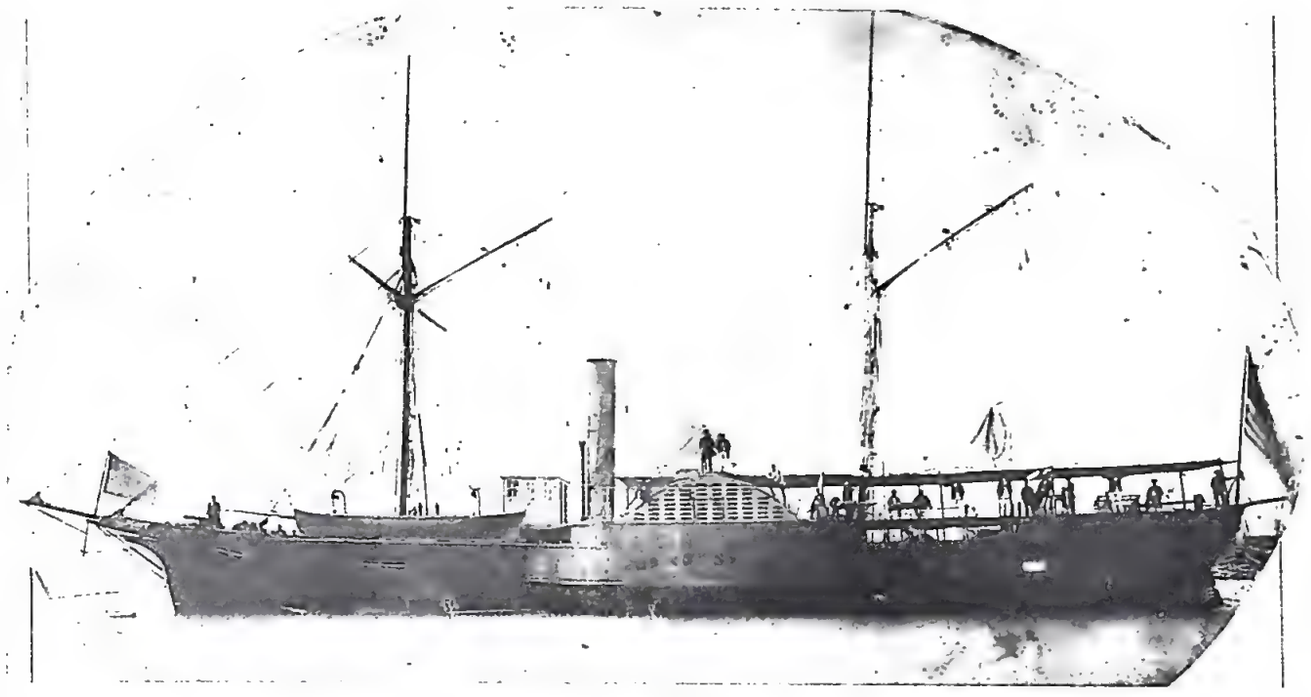
40. Walker to Howard, 9 June 1846, E 199, NA, RG 26.

41. John Webster to Walker, 12 July 1846, E 151, NA, RG 26; *Record of Movements*, 106; Howard to Walker, 4 June 1846, Howard to Webster, 11 July 1846, E 151, NA, RG 26; *Annual Report Revenue Marine Service*, 1848, H. Ex. Doc. No. 30, 30th Cong., 1st sess.; Walker to Howard, 16 December 1846, E 143, NA, RG 26; K. Jack Bauer, *The Mexican War 1846-1848* (New York: The Macmillan Company, Inc., 1974), 116-120.

42. *Record of Movements*, 109; Nones to Secretary of the Treasury, 7, 21, March 1845, E 151, NA, RG 26; *Legare* Log, 9 April 1845, NA, RG 26; "In the matter of the claim of Lieutenant William W. Hunter," 12 October 1852, E 199, NA, RG 26; Walker to Robert Day, 27 August 1845, *Legare* Log, NA, RG 26.

43. Walker to Coste, 17 November 1845, E 143, NA, RG 26; *Record of Movements*, 109-110; Coste to Webster, 19 August 1846, J. A. Ruggles to Coste, 18 September 1846, Coste to Webster, 5 October 1846, E 151, NA, RG 26.

44. Smith, *Early History*, 71; *Record of Movements*, 128; Walker to Hunter, 4, 12 December 1846, E 143, NA, RG 26; Hunter to Walker, 10, 14 December 1846, 30 January, 23 February 1847, E 151, NA, RG 26.



After her conversion to a side-wheel vessel, *Bibb* was transferred to the Coast Survey. She is pictured above as a Coast Survey vessel at Tortugas Harbor, Florida, in 1868. Naval Historical Center photo, courtesy of the U.S. Coast Guard Historian's Office.

Polk back to Norfolk, and in May the Navy returned her to the Treasury Department.[45]

Because of the delay in getting *Polk* ready, the converted steamer *Bibb*, already at New Orleans, was substituted for *Polk*. The alterations to *Bibb* had taken over one year due to the harsh winter in Cincinnati. Launched in November 1846, *Bibb* traveled to New Orleans in late December, making over eight knots during the trip. Like *McLane*, she carried four 32-pounders and one or two 18-pound pivot guns. Her added armament and ammunition, however, made her a crank ship. Her deeper draft forced her iron guards further toward the waterline, which interfered with the dead water coming from the paddles and impeded her speed. She lasted in service for four months and went back to Boston. Captain Winslow Foster commented about *Bibb* "that never a vessel left port so badly qualified to encounter a sea." He added that "This might have been a good useful vessel, of fair speed, had any nautical skill been employed, when she had prepared for the change in her propulsion . . . ."[46]

The last of the original Hunter wheel vessels to be completed was *Dallas*. Built in Buffalo, she was not finished for over two years after the signing of the contract because, in mid-construction, the department considered it wise to change the vessel to side-wheel propulsion. Launched on 4 April 1846 and ready for trial by August, she suffered maladies similar to the other steamers — among them insufficient steam pressure and obstructed vision for the helmsman. By October 1846 some of the imperfections had been corrected, and on a cruise to Detroit she made nearly eight knots.[47]

With most of the steamers now complete, the Revenue Marine began to face the grim reality that none of them would be useful. In early April 1847, *Legare* was surveyed for a possible three-month cruise along the East Coast. The surveying officers found her machinery so defective that they determined that the only way she could be made serviceable was to replace it. Ericsson helped to make a few changes and tested her in October in order to

45. *Record of Movements*, 128.

46. *Bibb* Log, 11 November 1845, 8 December 1846, 21 December 1846, Howard to Walker, 17 December 1845, passim, John Faunce to Walker, 23 November 1846, 13 October 1846, Foster to Walker, 3 March 1847, 4 June 1847, 31 May 1847, E 151, NA, RG 26.

47. Walker to Ottinger, 15 December 1845, 31 March 1846, E 143, NA, RG 26; Ottinger to Walker, 7 August 1846, Walker to Fraser, 17 August 1846, Michael Conner to Walker, 29 October 1846, E 151, NA, RG 26.

The *McLane*, shown here after her conversion to the Merrill's Shell Bank lightship. Note the similarity to the half model pictured on page 28. Photo courtesy of the U.S. Coast Guard Historian's Office.

turn the steamer over to the Coast Survey on 12 November.[48] She served for ten years with the Coast Survey and later, after conversion, as a lightship at Pass Mary Ann in the Gulf of Mexico.

Ericsson's other vessel, *Jefferson*, never played any important role for the cutter service. Contracted in January 1845, her construction was delayed due to alterations and mismanagement by Howard. The service made preliminary trials in April 1845. After reaching speeds of ten knots, Howard concluded that she was "without doubt very superior to any vessel" on the Great Lakes. Both of the Ericsson ships had problems with propellers breaking in the center, and in September 1845 *Jefferson*'s prop, like *Legare*'s, was replaced with a Loper propeller. The next month the department laid up *Jefferson* in Oswego for the winter. *Jefferson* served the rest of her career on the Great Lakes, being laid up each winter until November 1848, when she traveled to New York for alterations to her engine in preparation for her transfer to the Coast Survey in June 1849.[49]

The Hunter wheel vessels also found their way into obsolescence and then into other service. *Dallas* was conveyed to the Coast Survey but was never put into service. She was later sold for $5,264 and refitted by a private owner. The *McLane*, which may have cost a total of $220,000, was advertised for sale for an entire month in New Orleans and the department received only one bid for $3,000. To serve the government's interests better, she was transferred to the Lighthouse Service and was converted into a lightship for Merrill's Shell Bank, Mississippi, where she remained until 1859. *Spencer* also became a lightship at Willoughby's Spit in the Chesapeake. *Bibb*, like *Legare*, was transferred to the Coast Survey and served many years with that agency.[50]

The side-wheel vessels, *Polk* and *Walker*, built with tested and tried technology, had a shorter period of service than the Hunter wheel ships. *Walker* was delayed from the beginning due to difficulty in obtaining iron from the mill and bad weather. Disagreements with the builders and faulty drawings continued to delay her progress, and in September 1847, Secretary Walker "deferred the launching . . . until further orders . . . ."[51] She was finally launched in November, and her captain proclaimed her "the finest iron vessel ever built in this country." Once completed and her engines tested, she steamed down river to New Orleans to be turned over to the Coast Survey.[52]

48. J. R. Anderson to Coste, 7 April 1847, E 151, NA, RG 26; Walker to Coste, 5 April, 8 May 1847, E 143, NA, RG 26; *Legare* Log, 26 June 1847, NA, RG 26; Walker to Coste, 7 October 1847, E 143, NA, RG 26; *Record of Movements*, 110.

49. Howard to Bibb, 13 December 1844, Walker to Howard, 11 March 1845, Howard to Walker, 14 April 1845, E 151, NA, RG 26; *Jefferson* Steam Journal, 1 May 1845, NA, RG 26; Walker to John Whitcomb, 20 September 1845, 7 October 1845, E 151, NA, RG 26; *Jefferson* Log, 1 April 1847, NA, RG 26; Walker to Howard, 8 July 1848, E 143, NA, RG 26; Howard to Young, 26 August 1848, E 151, NA, RG 26; Howard to W.M. Merideth, 5 May 1849, E 143, NA, RG 26.

50. *Record of Movements*, 107, 108, 111, 394; Howard to Walker, 2 October 1848, E 151, NA, RG 26; Walker to William Gibbs McNeill, 18 October 1848, E 199, NA, RG 26; Walker to Stephen Pleasonton, 11 October 1847, E 143, NA, RG 26; "Revenue Steamers Transferred to the Coast Survey," 30th Cong., 2d sess., House Report 137, 3; Newspaper article entitled "Revenue Cutter Service," (n.d.) Manuscript Collection, U.S. Coast Guard Academy.

51. Bibb to Senate, 2 January 1845, E 143, NA, RG 26; Richard Evans to Walker, 6 October 1845, 26 January 1846, 14 September 1847, E 151, NA, RG 26; Walker to Evans, 18 September 1847, E 143, NA, RG 26.

52. Evans to Walker, 27 November, 13 December 1847, E 151, NA, RG 26; Young to Evans, 16 December 1847, E 143, NA, RG 26.

Polk's problems were never solved. After attempting adjustments, the department found no workable solution and decided to convert her into a sailing bark. The building of *Polk* had likely cost the government over $200,000. It would have cost at least $25,000 more to make her an efficient steamer, whereas it cost only $4,000 to transform her into a sailing vessel. As a measure of thrift, her machinery was transferred to *Jefferson* and the spars and stores of *Jefferson* and *Dallas* were used to outfit *Polk*.[53] *Polk* served on the West Coast until 1854.

The Revenue Cutter Service made virtually every mistake that could have been made in its first steam building program. The Hunter wheel was a technological anomaly which the bureau adopted too quickly. The designers of the steamers attempted to utilize a combination of sail and steam propulsion, with the final product being a combination of the bad qualities of each. None of the ships had enough power with either mode of propulsion to be effective revenue vessels. The numerous problems indicate that they had not been designed by practical seamen or practical engineers.

The design of the hulls for the Hunter wheel steamers aggravated their problem further. The inverted bell-shaped hull had little structural strength and compromised the ship's stability and sailing qualities. The arrangements for coal stowage further aggravated the stability problem. The engine rooms were extremely large and lay in the middle of the ships, which caused problems in masting them. They were all crank and unstable under sail.[54]

The engines were experimental in nature and had never been tested before being purchased. Screw-propelled vessels required engines producing higher revolutions to turn the shaft at high speeds. Seagoing side-wheel vessels of the day used fifteen pounds of steam pressure and turned at twenty revolutions per minute. Ericsson's engines used high-pressure steam designed to turn the propeller at forty to fifty revolutions per minute with forty pounds of steam. This pressure was too high for the low-pressure boilers, causing them to foam and blow out packing when attempts were made to keep up the steam pressure that the engines required. The high shaft speeds caused bearings to run hot, and lubricants, not yet designed for these speeds, broke down. The lack of steam caused the engines to run fast until the steam ran out and then slowly while waiting for steam to build to the proper pressure once again. This lack of working pressure was aggravated by the fact that the piston stroke was about half the length of most contemporary steam engines, which caused a greater waste of steam at the end of the cylinder. The attempt to increase the revolutions with cogged gearing in the converted Hunter wheel vessels admitted the problem of vibration and caused a rapid wear-and-tear on wooden and iron gears. At each stroke of the engine, the iron plates sprung two inches. These leaks were hard to find and difficult to repair if found, due to the poor quality and thinness of the iron plates.[55]

Both modes of propulsion were novel and unreliable. Ericsson's propellers were overly complicated for this period. Two propellers on one shaft that counter-rotated were ahead of their time. They also put excess strain on the shafts of the steamers. Hunter's wheels were even more of an anomaly. Everyone failed to take into account the inefficient nature of the Hunter wheel, where as much as 50 to 70 percent of the propulsion power was lost pushing the water around the wheel wells.[56]

The cost of the steamers far exceeded all expectations. There were several reasons for this. Some of the contracts were made without competition and were so "vaguely executed" that the government was not protected from fraud or other abuses. Howard's extravagant tastes, lack of economy, and poor management of the accounts compounded the problems. Howard's superiors reprimanded him often for his expenditures and threatened to reject his accounts. In April 1845, the department received a bill for Moroccan leather seats for the boats on *Bibb* and silk linings for the bookcases. Walker wrote Howard that he was putting a stop to the lavish spending, and that, if the claim was "authentic," Howard would be required to pay the bill.[57] The department perhaps expected too much of Howard, who had to travel between the different building sites and could never give the time necessary to oversee all the vessels. With no clerical help, Howard had to deal with different ships and contractors in cities hundreds of miles apart, and his poor managerial abilities were never adequate for such a complicated project.

Before building commenced, the estimated cost for these vessels was less than $50,000 each. Costs soared quickly as the dimensions increased. The weight of the

53. *Polk* Log, 12 August 1847, NA, RG 26; Hunter, Day, Fraser and Ottinger to Walker, 8 September 1847, Hunter to Walker, 13 March 1847, Howard to Walker, 27 November 1848, E 151, NA, RG 26; Newspaper article entitled "Revenue Cutter Service," Manuscript Collection, U. S. Coast Guard Academy; Howard to Walker, 14 September, 27 November 1848, E 151, NA, RG 26.

54. Bennett, *Steam Navy*, 57; Smith, *Early History*, 66.

55. John Bourne, *Treatise on the Steam Engine* (London: Longmans, Green and Company, 1849) 178-79, 224; Evans, *United States Coast Guard*, 47; *Polk* Log, 6 August 1847, NA, RG 26; "The Failure of the First Iron Revenue Steamers," Misc. Correspondence, E 155, NA, RG 26.

56. Evans, *United States Coast Guard*, 48-49.

57. Fraser to Bibb, 8 August 1844, E 151, NA, RG 26; Walker to Howard, 8 April 1845, E 143, NA, RG 26.

Table 1: Early Steam Vessels of the Revenue Marine

Name	Propulsion	Dimensions	Tonnage	Machinery
Bibb	Hunter wheel altered to side-wheel	160' length 24' beam 9' 3" forward draft 9' 9" aft draft	409	2 high-pressure horizontal noncondensing engines 36" stroke 24" diameter cylinder
Dallas	Hunter wheel altered to side-wheel	160' length 24' beam 9' 3" draft	391	2 high-pressure horizontal noncondensing engines 36" stroke 24" diameter cylinder
Jefferson	Propeller	160' length 24' beam 9' 9" draft	343	32" stroke 36" diameter cylinder
Legare	Propeller	160' length 24' beam 7' 6" forward draft 9' 9" aft draft	364	Horizontal back-acting engine 36" cylinder 32" stroke
McLane	Hunter wheel altered to side-wheel	161' length 24' beam (?) 9' 3" forward draft 9' 9" aft draft	369	2 high-pressure horizontal noncondensing engines 36" stroke 24" diameter cylinder
Polk	Side-wheel altered to bark	unknown	400	51½" diameter cylinder 50" stroke
Spencer	Hunter wheel altered to Loper propellers	160' length 24' beam 9' 3" forward draft 9' 3" aft draft	398	2 high-pressure horizontal noncondensing engines 36" stroke 24" diameter cylinder
Walker	Side-wheel	unknown	400	unknown

vessels had been underestimated, and the eventual cost for the steamers and the conversions was about $2 million at the time when the budget of the service was only $500,000 a year. Much of the cost of the steamers can be attributed to changes that were attempted in order to make them useable. In 1845 the service used 60 percent of its appropriations to pay for the contracts of these steamers. This lack of thrift caused Congress to prohibit the Treasury Department to build or purchase cutters without Congressional approval.[58]

58. Annual Report Captain Fraser, 1 December 1844, as cited in Smith, *Early History*, 63, 72; "The History of Wm. A. Howard," (n.d.), *History of Revenue Cutter Officers*, Misc., NA, RG 26; *Statutes at Large* 2, Ch. 78, 795.

The Revenue Marine risked a great deal on these steamers. They lasted only about three years, most of the time in an unusable condition, which was completely contrary to their intended lengthy service. The building program crippled the Revenue Marine in two ways. First, it dominated spending during the years immediately following the construction of the vessels. Second, the steamers, which comprised nearly one-third of the fleet in 1846, were out of service by 1849. That void forced the department to build seven new cutters in 1848, which further strained the budget. Moreover, the Treasury Department became so embarrassed and distrustful of steamers that it did not build another steam vessel for a dozen years.

While the Revenue Service lost a great deal, the Light House Service and the Coast Survey both benefited from

Dates of Service	Builder and Site	Remarks	Armament
1845-47	Charles Knapp Pittsburgh	Designed for Gulf of Mexico Contract entered 28 February 1843 Launched April 1845 Transferred to Coast Survey 1847 Decommissioned 1879	1 long 18-pounder 4 32-pounders
1846-49	Stillman, Statton, & Co. New York	Designed for Lake Erie Contract entered 2 April 1845 Launched 4 April 1846 at Buffalo Conveyed to Coast Survey 1849 Sold 4 March 1851	1 long 18-pounder
1845-49	Charles Knapp Pittsburgh	Designed for Lake Ontario Ready for sea 20 September 1845 Transferred to Coast Survey 27 June 1849	1 long 18-pounder
1844-47	R. & G.L. Schuyler New York	Contract entered 18 April 1843 Ready for crew May 1844 Transferred to Coast Survey 12 November 1847	1 long 18-pounder 1 9-pounder 2 4-pounders 1 12-pounder
1845-47	Cyrus Alger Boston	Contract entered 1 April 1843 Ready for trial 29 November 1845 Sold December 1847 Transformed into lightship	4 32-pounders
1847-54	J.R. Anderson Richmond, VA	Contract entered January 1845 Ready for service March 1847 Transformed into bark, Fall 1848 Sold December 1854	1 long and 4 short 32-pounders
1844-48	West Point Foundry Co. New York	Contract entered 18 April 1843 Transformed into lightship Willoughby's Spit 10 June 1848	4 12-pounders 1 long 18-pounder 1 9-pounder 1 12-pounder
1847-48	Joseph Tomlinson Pittsburgh	Contract entered December 1844 Launched November 1847 Tranferred to Coast Survey 1847	1 long and 2 short 32-pounders

these failures. The Light House Service received two lightships, while the Coast Survey obtained four steamers, all at no cost. This caused one contemporary observer to state that the enormous expenditures were "cast upon" the Revenue Service, whose officers had opposed the steam vessels from the beginning. He observed that naval officers interested in the Coast Survey had favored these steamers all along and had "laid the egg for the Revenue Marine to hatch," unjustly leaving the latter to "father the deformed offspring."[59] These vessels, built with unproven technology, truly proved to be a "lasting injury" to the Revenue Service and to the government.

59. Newspaper article entitled "Revenue Cutter Service," Manuscript Collection, U.S. Coast Guard Academy.

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The Transmission of Chinese Maritime Technology By the Arabs to Europe

VASSILIOS CHRISTIDES

CHINESE maritime technology was transmitted to the West primarily via Arabs and other Moslem peoples. The means of that transmission and the nature and extent of maritime technology transferred remain to be fully investigated. However, an examination of Arabic and Greek sources shows that, in addition to purely Chinese maritime inventions such as the single stern rudder, there is evidence of Chinese influence on the further development of existing inventions, such as certain forms of Greek Fire and methods of transporting animals at sea.

Two fields of technology in which Byzantines and Arabs both excelled were the science of navigation and the development of naval weaponry.[1] Most Byzantine literary sources dealing with navigation and naval warfare, save for a number of hagiographical works, have already been adequately studied. However, they are extremely difficult to interpret and leave great gaps in our knowledge of Byzantine maritime activities.[2] Arabic sources, on the other hand, have not yet been properly used, while a number of them still only exist in manuscript form. A thorough study of these sources could reveal a great deal about Moslem navies and might also shed light on the parallel development of the Byzantine navy.

To take one example at random, the works of Ibn al-Manqalī (second half of the thirteenth century)[3] have been little used. An edition of his work, *Al-Tadbīrāt al-Sulṭāniyah fī Siyāsah al-Ṣan'ā' al-ḥarbiyah* (Imperial Reflections on the Policies of the Craft of War) is, in fact, now in preparation by the present author, along with an English translation. In his *Aḥkām* (The Principles), Ibn al-Manqalī refers to the presence of physicians in Arab warships.[4] Such doctors most probably also existed in Byzantine warships, since there is epigraphic evidence that they had existed in the Roman navy.[5] Thus we read: *"t. Flavio Euprepeti/mil. class. pr. Mise/ medicus duplic./ vix. ann XXV, mil. ann V. P. Cassius Lucanus/ heres b. m. f."* (CIL, VI, 3910). ("To Flavius Euprepetius, navy officer from Misene, double paid physician, who lived twenty-five years; he served at the time of the consulate of V. P. Cassius Lucanus. His heir, as an action of benefaction, constructed [this monument].")

Another example which could lead to a better understanding of the way Byzantine naval warfare was conducted can be found by comparing a passage of Ibn al-Mamātī's *Kitāb Qawānīn al-Dawāwīn* (Book of Rules and Offices) with an often-quoted statement in Leo VI's

This article is based on a lecture delivered at the Department of History of the University of Kuwait. The author wishes to thank the Dean of Arts, Professor Mustafa Shaker, and the Chairman of the Department, Professor Badr el-Din, for the invitation to serve as Visiting Professor at the University of Kuwait in 1988, and Dr. David Nicolle of Nottingham University for his useful suggestions in the preparation of this article.

1. For the importance of naval technology in the understanding of medieval naval history in general, see my article "Naval History and Naval Technology in Medieval Times: The Need for Interdisciplinary Studies," *Byzantion* 58 (1988): 309-332. A typical example of the failure of certain historians to take into consideration naval technology in the historical evaluation of naval battles is discussed in my article "The Naval Engagement of Dhāt aṣ-Ṣawārī A.H. 34/A.D. 655-656: A Classical Example of Naval Incompetence," Βυζαντινά 13 (1985): 1331-1342.

2. H. Bibicou, "Sources byzantines pour servir à l'histoire maritime," in *Les sources de l'histoire maritime en Europe, du moyen âge au XVIII siècle*, ed. M. Mollat (Paris, 1962), 121-135; H. Ahrweiler, *Byzance et la mer* (Paris, 1966).

3. See some sporadic references in D. Nakhili, *Al-Sufun al-Islāmiyah* (Alexandria, 1979), and in my book *The Conquest of Crete by the Arabs (ca. 824): A Turning Point in the Struggle Between Byzantium and Islam* (Athens, 1984).

4. V. Christides, "Naval Warfare in the Eastern Mediterranean (6th - 14th centuries): An Arabic Translation of Leo VI's *Naumachica*," *Graeco-Arabica* 3 (1984): 143.

5. H. A. Callies, "Zur Stellung der Medici im römischen Heer," *Medizin-historisches Journal* 4 (1968): 18-27; V. Nutton, "The Doctors of the Roman Navy," *Epigraphica* 32 (1970): 66-71.

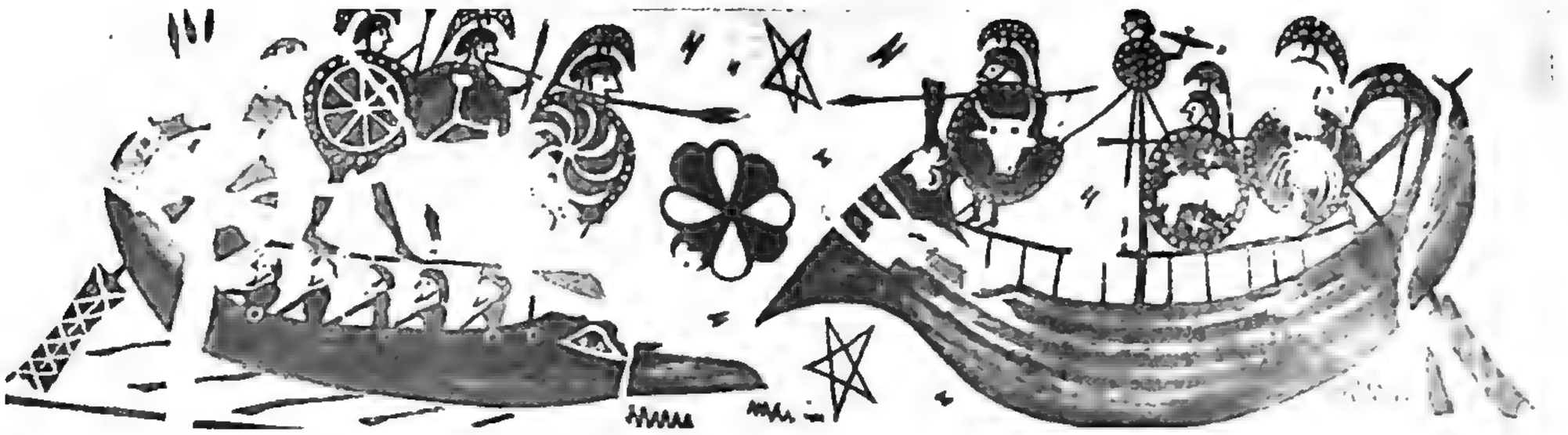

Figure 1: A depiction of a naval battle on the vase of Aristonathos clearly distinguishes marines superimposed over the oarsmen. From G. Lefebvre des Noëttes, *De la Marine antique à la marine moderne* (Paris, 1935), figure 31.

Naumachica of the tenth century.[6] According to Ibn al-Mamātī, while the oarsmen of the Arab ship were rowing rhythmically on the lower level, the soldiers, placed on the higher level, were fighting. In the *Naumachica*, on the other hand, fifty oarsmen on the upper level were simultaneously fighters. Ibn al-Mamātī's statement coincides with our knowledge of practices followed in earlier times, as is clearly attested — in addition to the literary sources — in a drawing of a naval battle on the bowl of Aristonathos dating from the seventh century B.C. In this drawing, the sailors appear to be rowing while the superimposed soldiers are engaged in fighting (see figure 1 above).

In a previous work, I attributed this difference between Moslems and Byzantines to a stricter division of duties among Moslem crews.[7] But perhaps we should not take Leo VI's statement at its face value — bearing in mind the information provided by Ibn al-Mamātī. Instead we might assume that in the Byzantine dromons, as in the Arab warships, oarsmen only occasionally performed the duties of soldiers.

Although Byzantine and Arab naval technologies were so interwoven that it is difficult to distinguish the particular characteristics of each of them, the Arabs could also draw upon Chinese naval technology. The most conspicuous cases in which these three traditions (Byzantine, Moslem, and Chinese) appear intermingled are in the invention and use of so-called "Greek" or liquid fire and in the single stern rudder.

6. For the relevant references, see my article "Two Parallel Naval Guides of the Tenth Century: Qudāma's Document and Leo VI's *Naumachica*: A Study in Byzantine and Moslem Naval Preparedness," *Graeco-Arabica* 1 (1982): 84 ff.

7. Ibid.

The Single Stern Rudder

There is reliable evidence that the single stern rudder was either transmitted from China via the pre-Islamic Arabs to Europe, or was invented independently in Egypt. In ancient times, while a single side rudder consisting of a huge oar was used on river ships, seagoing ships were normally guided by double steering oars near the stern of the ship. Numerous literary references and pictorial representations deal with ancient Greek and Byzantine ships using such double steering oars. The place of origin of the stern rudder has, however, remained a puzzling problem for scholars of nautical history. As far as Europe is concerned, the invention of the stern rudder is usually attributed to sometime shortly before 1242 A.D., a belief based upon a representation on the seal of the German town of Elbing. I have, however, shown in previous works that there is ample literary and pictorial evidence to dispute such a late date.[8] We can also add the depiction of a ship with a clearly defined axial stern rudder in a limestone funeral stela from Meydum in Egypt (see figure 2 on page 40), which dates from the sixth century A.D.

Since the Chinese had used a single stern rudder from at least the first century B.C. (see figure 3 on page 40), it

8. V. Christides, *The Conquest of Crete by the Arabs (ca. 824)*, 46 ff. While certain authors exaggerate the importance of the invention of the stern rudder, we cannot dismiss its importance, as J. Rougé does in his *Recherches sur l'organization du commerce maritime en Méditerranée sous l'Empire Romain* (Paris, 1966), 61. In addition it should be noted that while J. H. Pryor had expressed certain reservations concerning the early appearance of the stern rudder in his book *Geography, Technology, and War: Studies in the Maritime History of the Mediterranean, 649-1571* (Cambridge, 1988), 60-61, in a recent article he modified his view: "The Medieval Muslim Ships of the Pisan Bacini," *The Mariner's Mirror* 76, no. 2 (1990): 107.

Figure 2: A sixth-century Egyptian funerary stela from Meydum shows a depiction of a stern rudder. Staatliche Museum, 9625.

is highly likely that the Arabs borrowed this invention from them and subsequently introduced it to Europe. There had, of course, been mutual influence in nautical technology between Arabs and Chinese from pre-Islamic times.[9] During the Han Dynasty (206 B.C. — 220 A.D.), the nautical technology of the inhabitants of Oman in eastern Arabia was known to the Chinese. Numerous Chinese travellers, merchants and officials had travelled to the countries of the Persian Gulf by the sixth century A.D., as is recorded in Chinese sources.[10]

During the T'ang period (621-907), Arabo-Chinese relations were intensified. In the geographical work of Kia Ten, composed between the years 785 and 805 A.D., trade relations between China and the Persian Gulf are explicitly

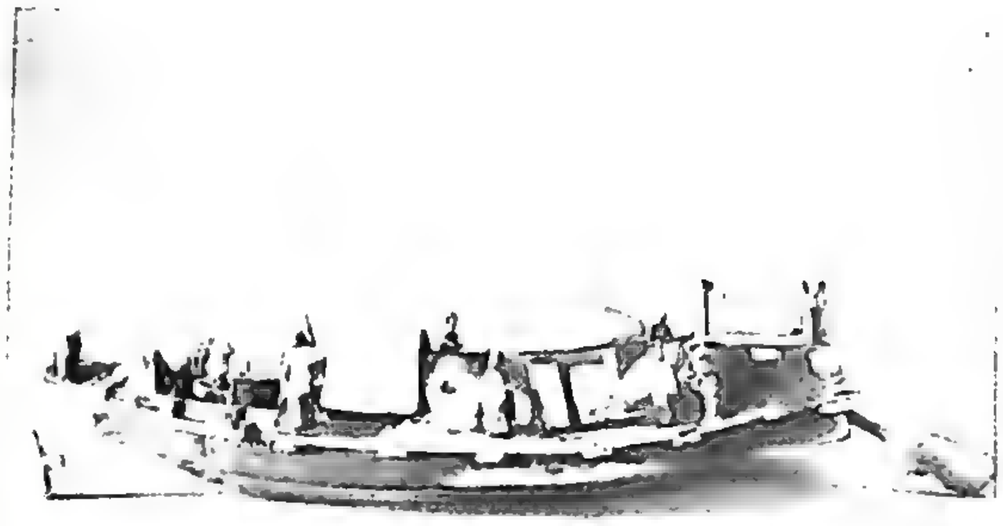

Figure 3: This model of a Chinese ship from the first century B.C. shows a single stern rudder. Photo courtesy of Professor Zhang Jun-yan, Peking University.

recorded.[11] Most probably it was at this time that the single stern rudder was introduced from China to the Arabs who then transferred it via the Gulf to the shipyards of Egypt.

It must also be noted that during the T'ang period there were sporadic relations between China and Byzantium, which was vaguely mentioned as "Fu-lin" in the Chinese sources.[12] Yet it is improbable that the Byzantines borrowed any naval technology directly from the Chinese at that time.

India and Indian ships probably played an important role as a connecting link between China and the Arab world. Literary and ceramic evidence shows that the port of Broach in northwestern India became a meeting place for Chinese and Moslem vessels.[13] The invention of the single stern rudder could thus have passed to the Arabs through their contacts with Indian vessels in the Indian ports in pre-Islamic or early Islamic times.[14]

9. Zhang Jun-yan, "Relations between China and the Arabs in Early Times," *The Journal of Oman Studies* 6, no. 1 (1983): 92.

10. See, for example, the ancient book *Mu-Tian-Zi-Zhuan*, written by an anonymous author in the pre-Imperial period; Te-Khum, "Travels of the Emperor Mu," *Journal of the Royal Asiatic Society* (North China Branch) 64 (1963): 124 ff. Another pertinent book, *Hou-Han-Shu*, was written ca. 445 A.D. by Fan Ye (398-445). A. Pfizmaier translated some chapters of it into German, published in the *Sitzungsberichte d. Akademie d. Wissenschaften* (Vienna, 1969).

11. P. Pelliot, "Deux itineraires de Chine en Inde à la fin du VIII[e] siècle," *Bulletin d'Etudes Françaises d'Extrême Orient* 4 (1904): 31-413, and M. G. Ferrand, "Le K'ouen-louen et les anciennes navigations interocéaniques dans les mers du Sud," *Journal Asiatique* 11th series, 14 (1919): 52.

12. F. Hirth, "The Mystery of Fu-lin," *Journal of the American Oriental Society* 30 (1910): 1-31; ibid. 33 (1913): 193-208.

13. J. Carswell, "China and Islam, A Survey of the Coast of India and Ceylon," *Transactions of the Oriental Ceramic Society* (1977-1978): 25-45.

14. See my article "Some Remarks on the Mediterranean and Red Sea Ships in Ancient and Medieval Times," *Tropis* 2 (1991):87-99. Some important iconographic material in this article was drawn from D. Nicolle's article "Shipping in Islamic Art: Seventh Through Sixteenth

Unfortunately, there is as yet no evidence of the possible transmission of the single stern rudder directly from China to the Arab world, and the only concrete iconographic evidence we possess is an illumination of a small Arab boat with an axial stern rudder, carrying sailors with obvious Chinese characteristics. This, however, is dated to a much later period.[15]

Greek or Liquid Fire: The Triple Tradition

It is a well-known fact that the Arabs transmitted the art of papermaking from China to the West during the eighth century. The magnetic compass and gunpowder were later similarly transmitted.[16] A question naturally arises as to whether any technology concerning the preparation and/or launching of Greek Fire was also transmitted via the Moslems to the West. There is no doubt that Greek Fire became an efficient weapon when it was perfected by Kallinikos. Various Byzantine sources state that Kallinikos, who was either from Heliopolis (Baalbeck) in Lebanon or, as at least one report maintains, from Heliopolis ('Ayn Shams) in Egypt, "invented" Greek Fire in the seventh century A.D.[17] If he was from Heliopolis in Egypt he undoubtedly drew information from the long-established scientific tradition of Egypt. By the late seventh century the Moslem Arabs were, of course, also familiar with the Graeco-Roman legacy of technology which they found in both Egypt and Syria.

The Arab conquest of Egypt in the middle of the seventh century provided the conquerors not only with shipyards and technicians but also with the well-advanced

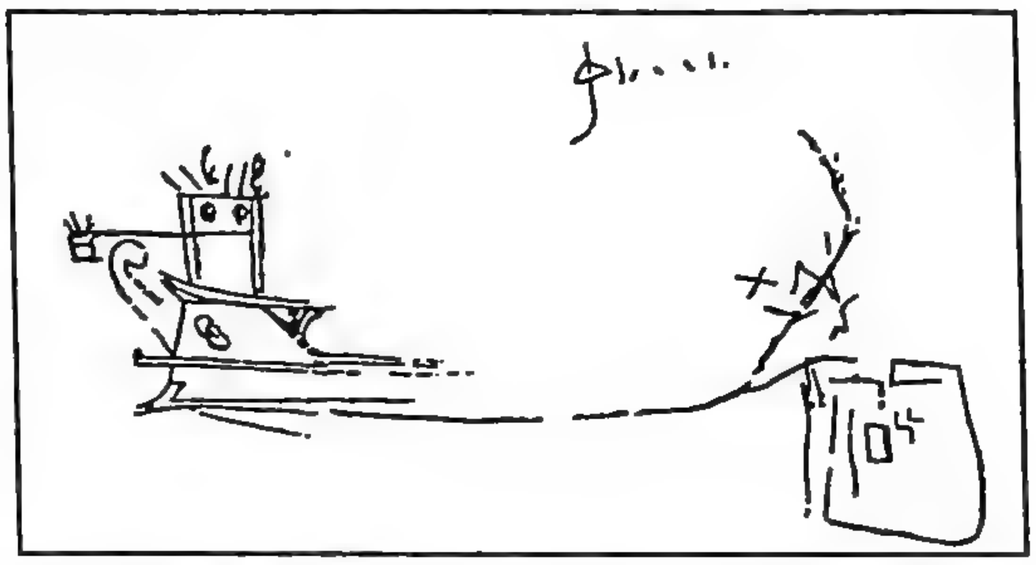

Figure 4: Graffito in a first-century B.C. Alexandrian tomb shows a fire pot on a warship. From Lionel Casson, *Ships and Seamanship in the Ancient World* (Princeton: Princeton University Press, 1971), plate 115.

scientific tradition of Alexandria. Translations of Alexandrian scientific works from Greek into Arabic were almost certainly made much later, in the 'Abbāsid period, yet it would have been natural that, along with shipyards, an Alexandrian technology of naval weapons was also transmitted to the Arabs.[18] As early as the first century B.C., this tradition had enabled the Alexandrians to use a primitive method of launching fire during naval battles, as revealed on an Alexandrian graffito (see figure 4 above). The Arabs who, according to Arabic sources, used naft (Greek Fire) in their siege of Constantinople in 675-678 A.D.,[19] drew on such an Alexandrian tradition.

By the tenth century, continuous mutual influences in the technology of incendiary naval weapons contributed to parallel developments of different types of Greek Fire in Byzantium and the Arab world. A question which cannot be easily answered, however, is whether those Arabs who transmitted gunpowder from China to Europe also made use of other Chinese-type incendiary weapons.[20]

While the Byzantines' first use of Greek Fire originated from Syria and/or Egypt, it seems that by the tenth century the Byzantines were borrowing more

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Centuries A.D.," *The American Neptune* 49, no. 3 (1989):168-197.

15. See Christides, "Two Parallel Naval Guides of the Tenth Century," figure 27.

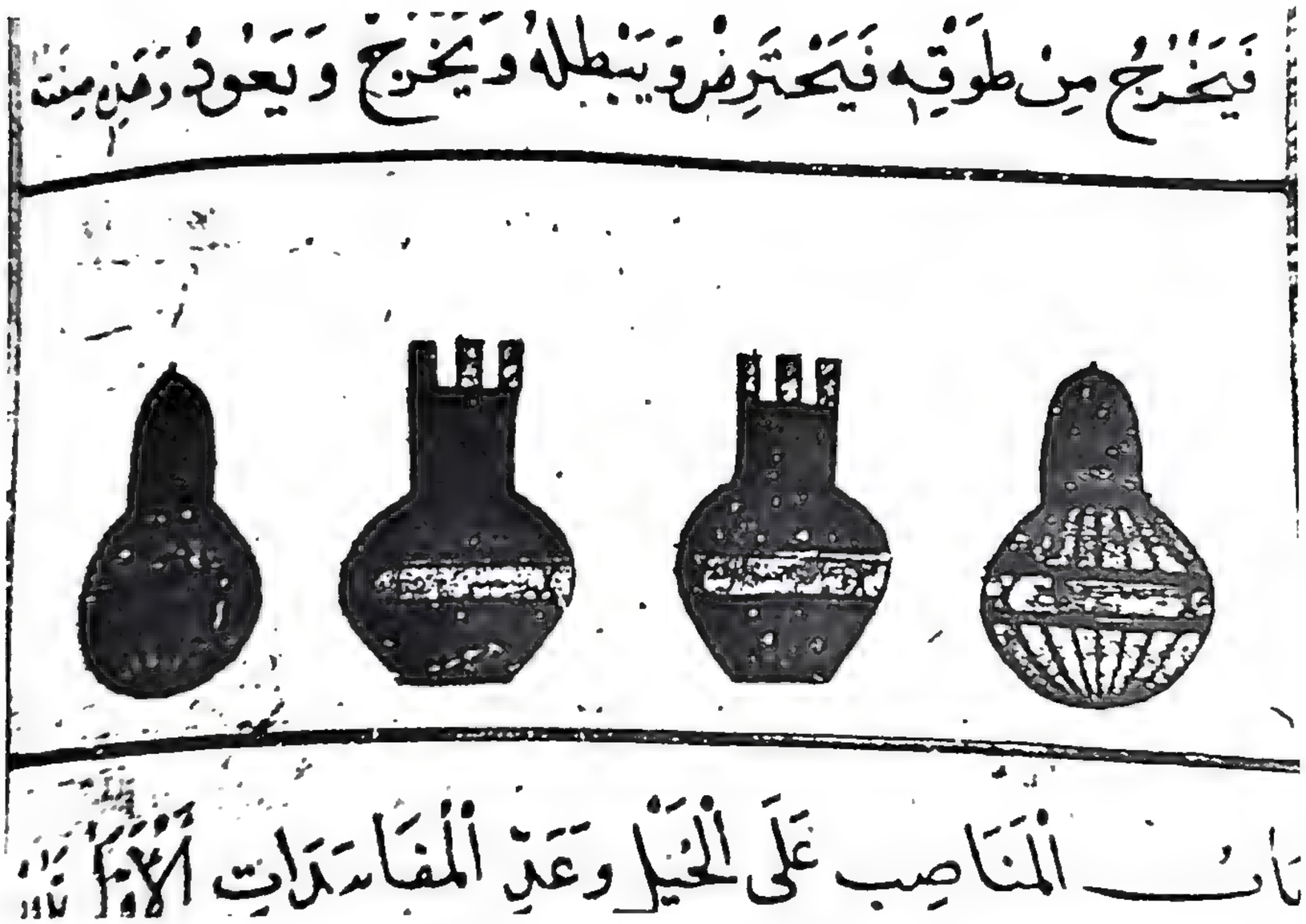
16. For the technological exchanges between the Arabs and Chinese, see Zhang Jun-yan, "Relations between China and the Arabs in Early Times," 97 ff. For the transmission and proper use of the compass in the West, as well as the economic consequences of the invention of the compass, see F. C. Lane, "The Economic Meaning of the Invention of the Compass," *The American Historical Review* 68, no.3 (1963): 605-617.

17. The problem of the transmission of the Alexandrian tradition in naval warfare is treated in my forthcoming book on "Greek Fire" to be published in collaboration with Professor T. Kolias; in this work all available Greek and Arabic sources will be combined. One-sided use of only the Greek sources leads to a dead end. Thus, utterly worthless is Th. Korres' book *"Ύγρόν πῦρ" Ένα σπλο της βυζαντινής ναυτικής τακτικής ["Liquid Fire," A Weapon of the Byzantine Navy]*, 2nd ed. (Thessaloniki, 1989). See also my article "Naft," to appear in the 2nd edition of the *Encyclopaedia of Islam*.

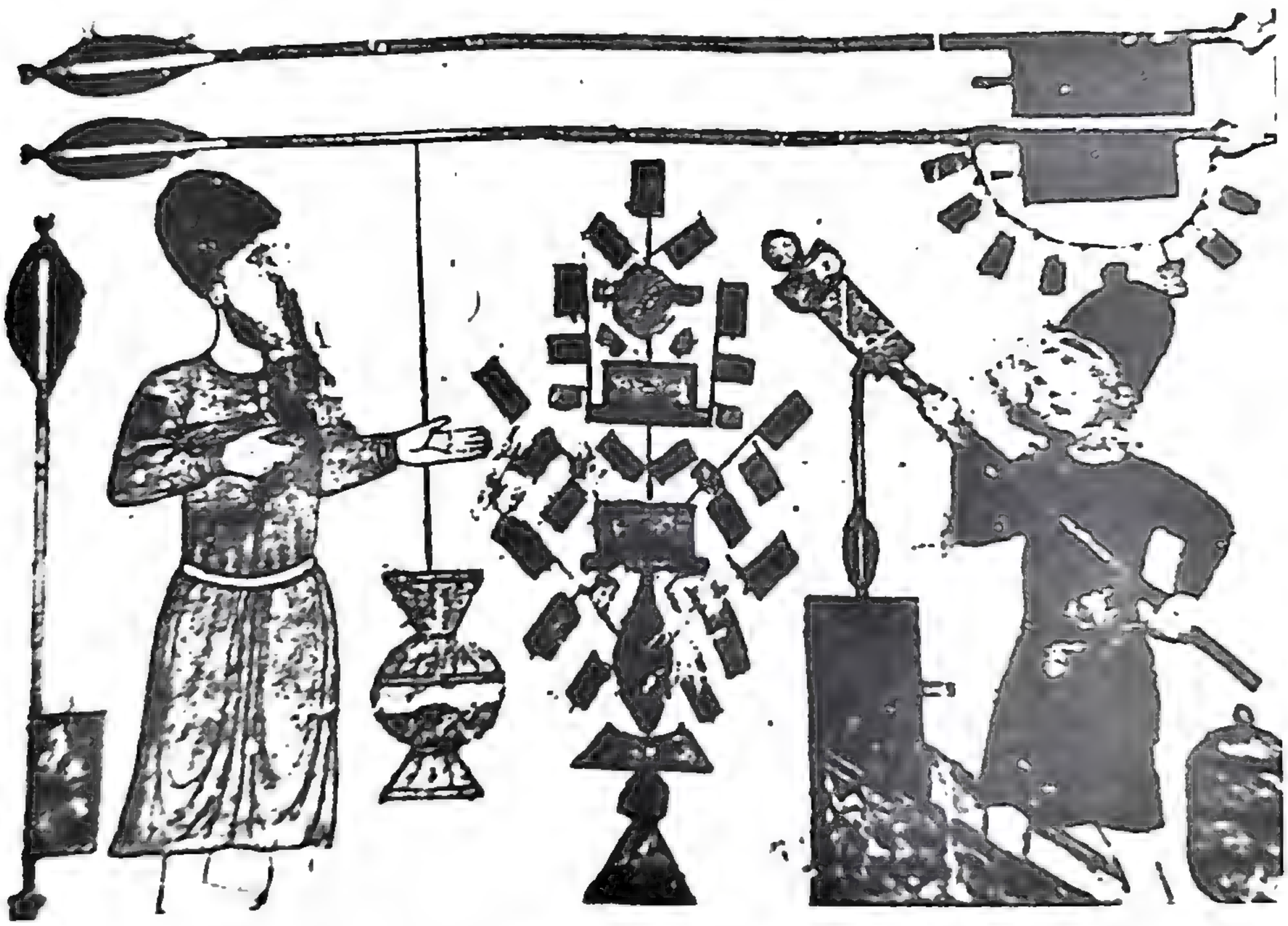
18. For discussions of certain spurious Alexandrian texts written in Arabic and dealing with warfare, see A. Zaki, "Military Literature of the Arabs," *Cahiers d'Histoire Egyptienne* 7, fasc. 3 (1955): 149-160, and G. Ziakas, Ο Αριστοτέλης στην Αραβική παράδοση *[Aristotle in the Arabic Tradition]*, (Thessaloniki, 1980), 2.

19. For references to this expedition in the Byzantine sources, see G. Huxley's unpublished paper "Why Did the Byzantine Empire Not Fall to the Arabs?" (Athens, 1986), 6 ff.; for the Arabic sources, see above note 17.

20. The basic works on gunpowder are still D. Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom* (London, 1956), and J. R. Partington, *History of Greek Fire and Gunpowder* (Cambridge, 1960).



Figures 5 and 6: Illuminations of fire bombs (above) carried on lances (below) in an Arabic manuscript resemble Chinese illuminations. From the Arabic MS of Leningrad, courtesy of Dr. N. Serikov.



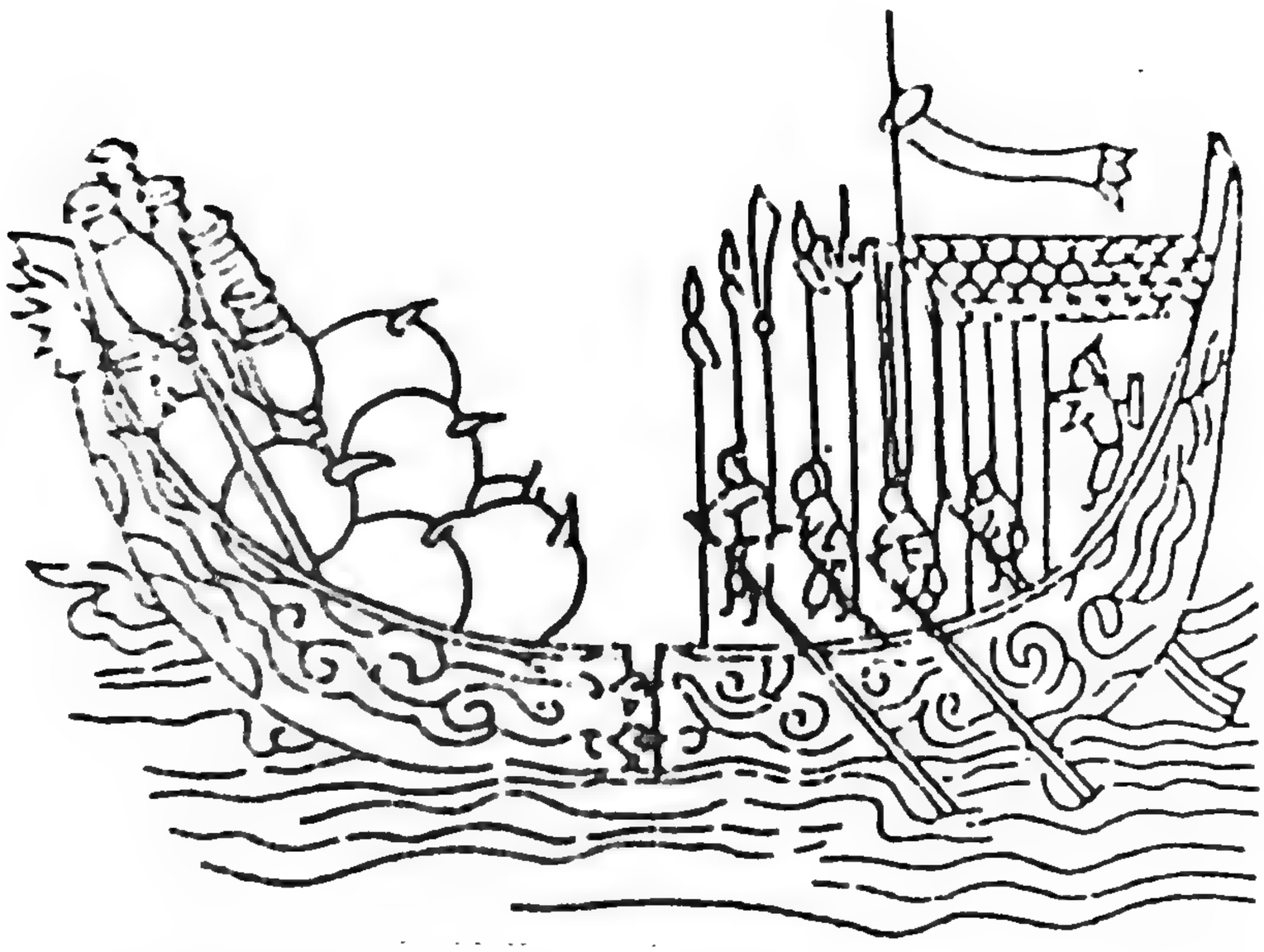


Figure 7: A Chinese *burlotte* is depicted loaded with firebombs carried on lances, as in Arabic manuscripts. Note the similarity to the Arab lances in figure 6 on page 42. Photo courtesy of Professor Zhang Jun-yan, Peking University.

Figure 8: The Edinburgh Rashīd al-Dīn manuscript, 1350, contains a battle scene with a depiction of a catapult with fire bombs. From D. Talbot Rice, *Islamic Art* (New York and Washington: Thames Hudson, 1969), figure 116.

advanced incendiary weapons from their enemies, the Fāṭimids, who made extensive use of them.[21] Meanwhile, the Fāṭimids, after they conquered Egypt in 969, had developed close relations with the Chinese. Recent finds in Fusṭāṭ (now a suburb of Cairo) of Chinese bowls and vases with fine incised designs clearly reflect trade relations between Fāṭimid Egypt and China.[22] Thus, the abundant use of various types of Greek Fire by the Fāṭimids could have been explained by their close ties with China.

Chinese influence on naval technology and incendiary weapons in the Arabo-Islamic world and Europe continued after the collapse of the Fatimids, reaching its peak during the Mongol period. It was at the time of the Pax Mongolica, following the death of Genghis Khan (1277), that the art of printing, the magnetic compass, and other inventions passed to Europe.[23] An illustration from the fourteenth-century Chinese military manual *Wu Pei Chih* shows a ship loaded with fire bombs. These closely resemble depictions of fire bombs in illuminations of ships found in Arabic manuscripts, which often show fire bombs carried on lances, as was the case in Chinese illuminations (see figures 5, 6, and 7 on pages 42 and 43).

An illustration in the Edinburgh University Rashīd al-Dīn Persian manuscript, dating from 1306 and made in Mongol Iran, depicts a scene where a catapult for fire bombs is being used by Mongol soldiers (see figure 8 on page 43). It also reveals a definite Chinese influence in the construction of such war machines by the Arabs.[24] It therefore seems that, at least after the Mongol domination of the thirteenth century, there was a clear Chinese influence on Arabic incendiary weapons.

An illumination from the Chinese manual *Wu Pei Chih* also has another element of great interest. This is a ship of the *burlotte* type (see figure 7 on page 43), a vessel which was used effectively by the Greeks against the Turks in the Greek revolution of the early nineteenth century. In the Chinese illumination, this ship was made of two parts connected by hooks and rings. The daring Chinese sailors apparently attached the first part to the enemy ship and then set it on fire before unhooking the rear part and sailing away. If the Arabs had borrowed this type of *burlotte* vessel from their Chinese contacts in the Red Sea, the Persian Gulf, and the Indian Ocean, they must surely have applied it to the Mediterranean.

Animal Transport Ships

We can discern a certain Chinese influence on Arabo-Islamic naval technology concerning animal transport ships during the Mongol dominance.

Figure 9: A fifteenth-century illumination of Noah's Ark depicts a ship carrying animals. From C. S. Welch, *Peinture imperiale moghole* (New York, George Braziller Co., 1978), plate 9.

21. Y. Lev, "The Fāṭimid Navy, Byzantium, and the Mediterranean Sea 909-1036 C.E./297-427 A.H.," *Byzantion* 54 (1984): 247.

22. B. Gyllensvärd, "Recent Finds of Chinese Ceramics at Fostat," Part 2, *Bulletin of the Museum of Far Eastern Antiquities* 47 (1975): 93-117.

23. J. A. Boyle, "The Last Barbarian Invaders: The Impact of the Mongol Conquests upon East and West," *Memoirs and Proceedings of the Manchester Literary and Philosophical Society* 112 (1970): 1-15.

24. Rashīd al-Dīn's work provides the best account of the details of Mongol warfare. The manuscripts of his work are very useful for their illustrations. J. A. Boyle, "Juvaynī and Rashīd al-Dīn as Sources on the History of the Mongols," in *Historians of the Middle East*, ed. B. Lewis and P. M. Holt (London, 1962), 133-137. The Chinese type of fire machine used by the Mongols was called *Tchin-tien-lei;* see Rashīd al-Dīn, *Histoire des Mongols de la Perse*, ed. and trans. M. Quatremère (Paris, 1836), 135.

The transportation of wild animals was constant in medieval trade links between East Africa and the Arab world, as well as in the great trade artery linking Africa, India, and China.[25] The Arabs — as is attested in the literary sources — soon developed advanced technology in this field.[26] The artistic evidence could supplement the literary evidence since there are a number of Islamic illuminations depicting Noah's Ark from the early Moslem era to the fifteenth century. One late example is Miskin's beautiful painting dating from the time of the fifteenth-century Mughal leader Akbar (see figure 9 on page 44).

More work is needed in the collection of relevant evidence in this field of naval technology. Moreover, as Lionel Casson has suggested, the invention of that most important means of transporting goods by ship, wooden barrels, could also be traced to China.[27] It seems clear, however, that contacts between the Arab world and China were crucial in introducing or developing several elements of naval and maritime technology important to the medieval West.

25. For the relationship between China, India, and Africa, see E. H. L. Schwartz, "The Chinese Connection with Africa," *Journal of the Royal Asiatic Society of Bengal* 4 (1938): 175-193; S. D. Goitein, "From the Mediterranean to India," Part 1, *Speculum* 2 (1954): 181-195; T. Filesi, *Le relazioni della Cina con l'Africa nel Medio-Evo* (Milan, 1962); Wang Gungwu, "Les Chinois et les pays situés de l'autre coté de l'Océan Indien," *Revue Historique* (1980): 69-75; Th. Papadopoullos, "Influences historiques sur l'Afrique Orientale à travers l'Océan Indien," XVI[e] Congrès International des Sciences Historiques, Stuttgart, 1985 (1990):1-18; C.I. Beckwith, "The Impact of the Horse and Silk Trade on the Economies of T'ang China and the Uighur Empire," *Journal of the Economic and Social History of the Orient* 34 (1991): 183-198.

26. Of course, the naval technology concerning the transportation of animals had its roots in the Pharaonic and Greek times; see Christides, "Naval History and Naval Technology in Medieval Times," 318. An inscription from Egypt dating from 90 A.D. which is a sort of roster of tolls for persons and goods passing between the town of Coptos on the Nile and a Red Sea port mentions a whole load of camels: "πιττακιου καμηλοων οβολον ενα" (OGIS 674 = IGRR 1.1183, line 20).

27. L. Casson, "Hulls and Barrels: Underwater Archaeology's Vital Contributions to the History of Naval Technology," paper delivered at Delphi, the Second Symposium of Ship Construction in Antiquity (August, 1987). Some general information on China's trade relations with the West from the eighth to the fifteenth centuries is found in M. Tampoe, *Maritime Trade Between China and the West* (Oxford, 1989).

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A Gratifying Testimonial to a Captain

CHARLES DAWSON

When I inherited a ship's spyglass that once belonged to my great-grandfather, William Kennedy, of Greenock, Scotland, I was intrigued by the ringing tones of its Victorian inscription, with its sprinkling of capital letters, and by the elegant copperplate style in which it was written. The spyglass is a handsome instrument, two-and-one-half inches in diameter and twenty inches long, extending to some three feet. On the brass slide-tube that forms the sun-hood of the instrument are engraved the words: "Presented to Captain Kennedy of the Ship *Wallace*, by his crew, as a mark of Esteem for his Gentlemanly conduct to them during a voyage from San Francisco to Liverpool, January 17th 1854."

Was such conduct by a captain so rare that a ship's crew would celebrate it with such a handsome gift to him at the end of the voyage? We might think so if we take seriously the writers and filmmakers who have dramatized the seamier side of life at sea in the past. Despite the stern "Regulations for Maintaining Discipline" of the period — twenty-two in all, and pretty tyrannical they sound to us today — it is heartening to think that a captain could inspire his crew to such a gesture. I decided to investigate further.

The *Liverpool Telegraph & Shipping Gazette*, one of the nine newspapers being published at the time in the city, first reported the arrival of *Wallace* off the port on 14 January 1854 and followed her leisurely progress until 19 January, when she was reported alongside the Prince's Dock. Another newspaper, the *Liverpool Mercury*, printed an account on Friday, 20 January, of the actual presentation in the hall of the Sailor's Home, where the crew had assembled after having been paid off. The story, "A Gratifying Testimonial to a Captain," quoted the inscription as it appears on the spyglass and added: ". . . the crew stated that they never wished to sail with a kinder or a better man. The captain thanked them for their kindness. He said he was proud of them and could recommend them anywhere. The sailors then gave three hearty cheers for Captain Kennedy and the interesting proceedings terminated."

Wallace was a ship of 762 tons, measuring 139 feet by 30.8 feet by 22.6 feet, constructed of birch, spruce, hackmatack (Eastern Larch), and oak, with pine decks. At her bow was a full-length figurehead of the Scottish patriot Sir William Wallace. She was built at St. John, New Brunswick, Canada by George Thomson, who was from a family of shipowners and shipbuilders of Dumfries, Scotland.[1] A newspaper report of her 30 November 1840 launch called her "A fine new ship of 700 tons . . . . Take her altogether she is a noble looking vessel."

Carrying a cargo of timber, *Wallace* was sent overseas "by certificate." This meant that the Comptroller of Customs issued a certificate under which the vessel sailed directly to her owner's country, rather than being registered in Canada. Such a certificate recorded the dimensions, tonnage, place and date of launch, builder, owner, agent, destination, and master of a vessel. *Wallace*'s was issued at St. John on 1 December 1840. At the start of her voyage to England, however, she struck on the Murr Ledges off Grand Manan Island in the Bay of Fundy. When word came of the disaster, George Thomson left his largest ship, the *Princess Royal* of 1,109 tons, on the stocks and hastened down to Grand Manan to help *Wallace* off the ledge. But the dedicated builder "over exerted himself in this task and died at Grand Manan on 10 February 1841, aged 54 years; he had lived for and with his ships and he died for one of them."[2]

1. Thomson had come to Canada in 1816 as master of the brig *Jessie* and settled to build ships at L'Etang, a small harbor in the parish of St. George, Charlotte County, New Brunswick's most southerly county. In about 1826, he moved down the coast to the east side of St. John. His older brother John joined him in 1833 and was followed by his sons and grandsons in carrying on the family firm, which owned ships and built up the Thomson fleet. Confusion often arises with the family's surname, which is sometimes spelled with a "p," but this belongs to the family with Irish connections who built on the west side of St. John. Esther Clark Wright, *Saint John Ships and Their Builders* (Wolfville, Nova Scotia: Private publication by the author, 1976), 65.

2. Ibid., 69.

Table 1: Regulations for Maintaining Discipline

Offense		Amount of Fine or Punishment Days' Pay
1. Not being on Board at the time fixed by the Agreement		2
2. Not returning on Board at the expiration of Leave		1
3. Insolence or contemptuous language or behavior towards the Master or any Mate		1
4. Striking or assaulting any person on Board or belonging to the Ship		2
5. Quarrelling or provoking to quarrel		1
6. Swearing or using improper language		1
7. Bringing or having on Board spirituous liquors		3
8. Carrying a sheath knife		1
9. Drunkenness	first offense	2 days half-allowance of provisions
	second offense	2
10. Neglect on the part of the Officer in charge of the Watch to place the Look-out properly		2
11. Sleeping or gross negligence while on the Look-out		2
12. Not extinguishing lights at the times ordered		1
13. Smoking below		1
14. Neglecting to bring up, open out, and air bedding, when ordered		½
15. (For the Cook) Not having any Meal of the Crew ready at the appointed time		1
16. Not attending Divine Service on Sunday unless prevented by sickness or duty of the Ship		1
17. Interrupting Divine Service by indecorous conduct		1
18. Not being cleaned, shaved and washed, on Sundays		1
19. Washing clothes on a Sunday		1
20. Secreting contraband goods on Board with intent to smuggle		1 month
21. Destroying or defacing the copy of the Agreement which is made accessible to the Crew		1

22. If any officer is guilty of any Act or Default which is made subject to a Fine, he shall be liable to a Fine of twice the number of Days' Pay which would be exacted for a like Act or Default from a Seaman, and such Fine shall be paid and applied in the same manner as other Fines.

Wallace was repaired and sent in command of Captain Maine to Liverpool, where she was bought by Glen and Anderson of that port. There she was surveyed (Lloyd's Survey No. 4209) in Canning Graving Dock on 2 July 1841, and the comprehensive two-page foolscap-size report shows how thorough the survey was. In his general remarks, surveyor George Winram stated: "The general appearance of this ship is very good . . . . I think her worthy of any indulgence the committee may think proper to confer on her but from the quality of spruce in her, we could not strictly abiding by the rules ourselves recommend more than four years, but as she was launched on 30th November 1840 as per certificate dated St. Johns *(sic)* Decr. 1st 1840 the owners have every trust that the committee will extend the date of when built to 1841."

The Committee chose to ignore this plea to bend the rules and on 20 July 1841 assigned *Wallace* A1 classification for four years from the date of build, "if

sheathed and yellow-metalled, being done at present." She duly received her 4A1 Certificate and was finally registered in Liverpool on 7 August 1841.

At that time, Liverpool shipowners were buying considerable numbers of Canadian-built vessels; by the mid-1850s, over 50 percent of Liverpool ships had been built in Canada.[3] *Wallace* was some 25 percent larger than the average size Liverpool ship at the time. The survey report lists her destination as the "East Indies," a pretty vague term which appears to have meant India and parts further east. Her first listing in Lloyd's Register for 1842-43 states that her maiden voyage was to India, with Captain Maine still in command. He remained with her for some five years, during which she sailed to India, Port Phillip (Victoria, Australia), and Valparaiso. After that, Captain John Myers, born in Newcastle in 1821, took command for five years, voyaging to Port Phillip, Callao, Valparaiso, and Coquimba.

On 3 March 1852, *Wallace* left London, still in command of John Myers, and sailed for "the Pacific Ocean" with a crew of twenty-eight, including five apprentices. The number of apprentices a vessel was obliged to carry at that time was related to the vessel's tonnage. The Agreement signed by Captain Myers stated that "the voyage [was] not to last more than three years."[4] Before her long voyage she called at Cardiff, Wales, presumably for a cargo of coal that would serve as a paying ballast.

William Kennedy had finished a long spell of some six years as chief mate of the wood ship *Christian*, 449 tons, of Glasgow.[5] He had passed his examination in Glasgow on 15 January 1852, and his master's certificate was issued in Greenock, his hometown, on 23 January.[6]

Wallace's mate, twenty-eight-year-old William Matheson McKay of Dingwall, Scotland, left the ship at Cardiff, and William Kennedy seems to have been called at short notice to take his place. So, parting from his wife and three young sons at home in Greenock, William joined *Wallace* at Cardiff on 22 March. His wages were to be £6 per month.

Wallace sailed from Cardiff on 25 March. After little more than a week out, off Cape Finisterre, her carpenter, thirty-eight-year-old James Logan from Leith, Scotland, died and was buried at sea. In a special section of the Agreement, which the master was required to fill in after a death on board, appears a pathetic list of Logan's worldly possessions — his clothing and a chest of tools. The death of *Wallace*'s carpenter left an onerous burden for the carpenter's mate, twenty-year-old Guthrie Gibson of Fife County, Scotland, for *Wallace* was his first ship.

In his classic account *Two Years Before the Mast*, Richard Henry Dana describes the procedure for dealing with a deceased man's effects. After a young English sailor from the U.S. brig *Pilgrim* was lost overboard, ". . . the captain immediately after the burial holds an auction of the man's things, in which they are bid off by the sailors, and the sums which they give are deducted from their wages at the end of the voyage. In this way the trouble and risk of keeping the items throughout the voyage are avoided and the clothes are usually sold for more than they would be worth on shore."[7]

One hundred and forty-three days after sailing from Cardiff, *Wallace* arrived at Callao on 15 August 1852. William Kennedy became master ten days later.[8] No special reason for his promotion is annotated on the agreement. Also at Callao, twenty-five-year-old Charles Schönemann, of the Danish duchy of Holstein, was taken on as carpenter "to serve on the voyage to San Francisco and to work on board for ten days after her arrival there." Young Guthrie must have been glad to have someone with whom he could share the work.

If there was an opportunity for a little relaxation, perhaps some of the officers might have managed a visit to Lima, some ten miles inland. A new single-track railway had recently been built, making the journey safer; previously, it had been dangerous to take the post-chaise into town for fear of a holdup by bandits.[9]

Wallace sailed from Callao on 27 September, leaving behind an aging and sick seaman, a fifty-three-year-old Swede named John Clark. Here it is worth turning to Dana

3. Marwood's Liverpool Register, 1854, cited in Michael K. Stammers, *The Passage Makers* (Brighton: Teredo Books, 1978), 361.

4. This and other agreements for *Wallace*'s voyage are held by the British Public Record Office (PRO) Ref. B.T. 98/3843.

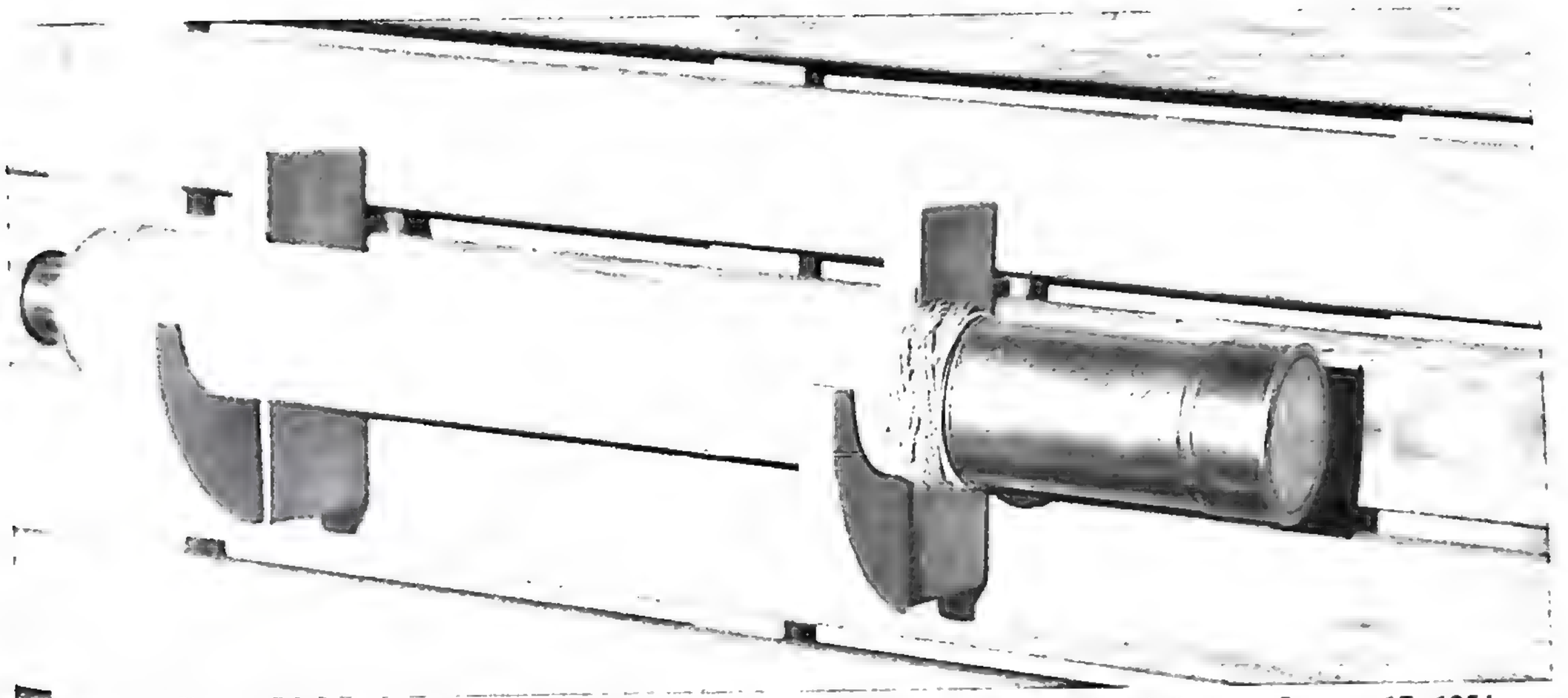
5. *Christian* was owned by Stirling, Gordon, the old established Glasgow firm trading to the West Indies. Many of their vessels had been built by the famous Greenock shipbuilder Scotts, particularly during the period 1780-1830, and it is felicitous that the great marine artist Robert Salmon, during his stay in Greenock from 1811 to 1822, depicted the preparations for her launch in 1818 from Scotts' yard in two fine paintings which still exist in Scotland, one at Kelvingrive Art Gallery and Museum, Glasgow, and the other at McLean Museum and Art Gallery, Greenock.

6. Kennedy's certificate number was 3375; his Register Ticket number was 184019.

7. Richard Henry Dana, *Two Years Before the Mast* (New York: Penguin American Library Edition, 1981), 79.

8. Annotated on his Captain's Record, PRO, Ref. B.T. 122/4.

9. Karl Johan Alfred Skogman, *Fregatten Eugenies Resa Omkring Jorden Åren 1851-3 [An Account of the First Circumnavigation by a Swedish Naval Vessel, the Frigate* Eugenie], vol. 1 (Stockholm: Alfred Bonnier, 1854), 132. *Eugenie* had called at Callao just five months before *Wallace*.



The spyglass presented to Captain William Kennedy by the crew of the Liverpool ship *Wallace* on January 17, 1854, was personalized with a canvas sheath and turk's head decorations. Photo courtesy of the author.

again for a description of the sort of harsh but unavoidable choice that must have faced the new captain: "A live dog is better than a dead lion and a sick sailor belongs to nobody's mess, so we left him behind with the rest of the lumber, which was only in the way."[10]

Wallace reached San Francisco in the middle of November, 1852. That she was no clipper is obvious from her sailing time from Cardiff of 192 days. Nor, for that matter, were most of the vessels crowding into the bay there. The clippers, however, were anxious to get a move on and be off again for tea from China. Captain Kennedy may have gotten a glimpse of *Witch of the Wave*, *Sovereign of the Seas*,[11] and *Southern Cross* before they left, but his problems would be far too great to think much more about them.

Wallace had arrived at the chaotic time when San Francisco was suffering from the all-too-rapid growth brought on by the great Gold Rush of 1848-49. The market had become glutted by the enormous influx of goods, and the result was plain for all to see: a bleak picture of hundreds of abandoned vessels, rocking at anchor in front of the city, that was so graphically depicted in daguerreotypes from the time. The lucky vessels were hauled ashore and converted into stores and lodging houses. Some were broken up for building material, while others just rotted away and sank at their moorings. Many of their remains still lie under the filled-in parts of the old Yerba Buena Cove, including some famous ones like *Cadmus*, which carried Lafayette to America in 1824, and *Plover*, which sailed the Arctic in search of Franklin.[12]

Like every other captain there at that time, William Kennedy had the constant problem of trying to replace seamen who had deserted. Nine of his had disappeared immediately on arrival. He did manage to hire two extra men to help work the ship in port, but he had to pay handsomely. When the going rate for a British seaman was £3 per month, he had to pay double that in San Francisco — no less than $25, with a month-and-a-half's pay in advance. The list of vessels from which replacement crewmen came reads like a roster of great ship's names: *Charles Mallory*, *Golden Fleece*, *Flying Cloud*, *Comet*, and the Baltimore clipper *Seamen*, all lately arrived in port from New York or Boston.

Wallace at last managed to set sail for home at the beginning of February 1853, and reached Callao at the end of April. Again, Kennedy had to take on substitute

10. Dana, *Two Years Before the Mast*, 363.

11. After her 103-day voyage from New York, *Sovereign of the Seas* called at Oahu, Hawaii, and then sailed back east via New York to Liverpool. There she was seen by the great owner of the Black Ball Line, James Baines, who decided she was the type of vessel he required to build up his fleet. He eventually commissioned four ships from her builder, Donald McKay, and later bought four more.

12. Hubert Howe Bancroft, *History of the Pacific States of North America, California*, vol. 7 (San Francisco: A.L. Bancroft and Company, 1882), 168.

crewmen, because the temptation had been too great for some of those who signed on at San Francisco with their advance of wages. They had jumped ship even before she sailed.

Next, *Wallace* called at the Chincha Islands to load guano, the desiccated remains of the droppings of seabirds, newly discovered as a natural fertilizer. The demand for cargoes of guano had given a needed boost to trade at a time of temporary depression in shipping.[13] Conditions were atrocious, however, for the poor natives who were employed to help scrape the material from the birds' nesting sites; they had almost become slave laborers at the guano deposits. Captains reported that, rather than submit further to their misery, they used to hurl themselves off the cliffs in desperate and dramatic suicide leaps. What the sailors must have thought about their work in loading the stuff on a windy day is best left to the imagination. One wonders what led to the desertion of one of *Wallace*'s new ABs at this desolate place.

Captain Kennedy and *Wallace* finally sailed for home at the end of September, 1853. On the homeward voyage the captain had, for the first time, the responsibility of taking his ship around Cape Horn. It was at this time that his youngest son Duncan, only four years old, had died, although, of course, he was not to know of that until he arrived home; the electric telegraph had still not arrived in those parts. Perhaps the blow was softened by the sight of his first daughter, Margaret, born not long after he left home.

Wallace was reported "off the port" of Liverpool on 14 January 1854, so she had made the reasonably good passage home from Callao of 106 days. One of the ships leaving port that might have passed *Wallace* was another St. John-built ship, the 808-ton *Laurel*, under her Scottish captain Simon Graham. It is likely that one of the steam paddle tugs like *John Bull* would have towed *Wallace* into the dock, at a cost to Captain Kennedy of about £10.

As a proud reminder of his ship, Captain Kennedy had a portrait of *Wallace* painted, perhaps in Liverpool by one of the many marine painters then working there, or in his hometown Greenock, where William Clark had already become justly celebrated. Sadly, the painting was sold out of the family, but maybe one day it will find its rightful place beside his spyglass.

Wallace was sold in 1854 to the renowned Glasgow shipbuilders Alexander Stephen and Son. It is probable that they used her for bringing home shipbuilding timber and other supplies, since they had shortly before disposed of their previous supply ship *Alexander*. According to Lloyd's Register, *Wallace* next sailed to Quebec under Captain D. Wilkie that same year and to Australia under Captain J. Robb in 1855-56. It is believed that she was sold in Valparaiso in 1858,[14] presumably to be used as a store ship or coal hulk.

I had set out on my quest hoping to find some dramatic story behind the presentation of the spyglass to Captain Kennedy, but I have failed to locate any. I have now come to the simple conclusion that the crew were just deeply thankful that their captain had brought them home at all. The five apprentices deserve a special mention, for they "stuck it out" all the way out and home. *Wallace*'s crew's superb final tribute when they presented the spyglass to their captain was no doubt their way of expressing their deep gratitude at having come through such a voyage safely, one that had lasted almost two years. Perhaps it was their idea to "personalize" the spyglass, for the original leather sheath is covered by one in hand-sewn canvas, with turk's head decorations at each end. One can imagine the sailmaker, thirty-two-year-old James Collins from London, working in secret overnight to have it ready for the presentation. Of course, the prosaic truth may be that the captain ordered this himself at some later date.[15]

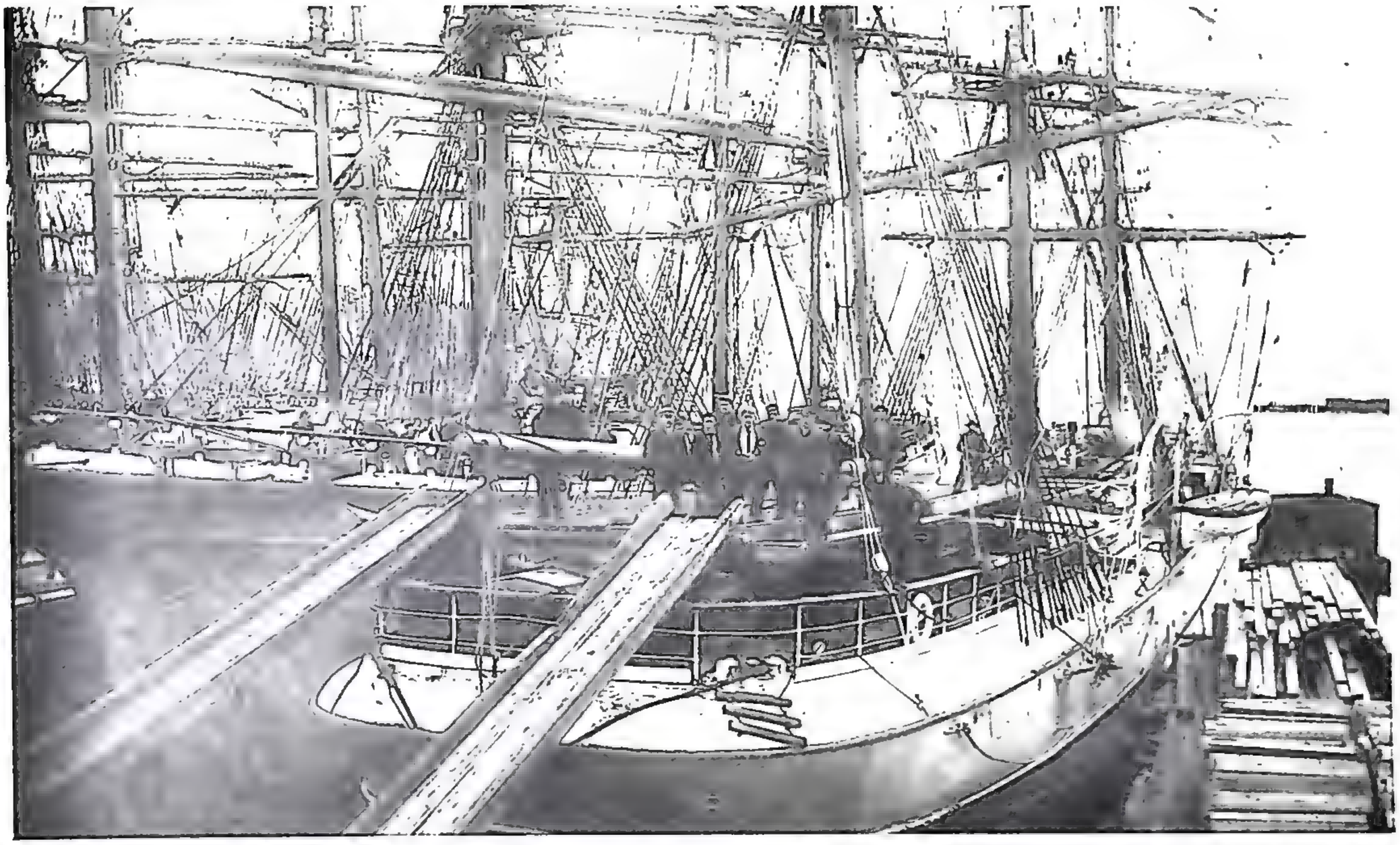
So ended Captain Kennedy's first voyage to San Francisco. After surviving two disasters at sea, he made many more voyages to different parts of the world: the East and West Indies, India, Australia, and New Zealand. Most of his voyages were in sailing vessels, but he had an intermediate spell with steamships, some in pioneering ventures.

Fittingly, Captain Kennedy returned for his second visit to San Francisco in command of one of the big iron windjammers, the full-rigged iron ship *Dunbritton*, built in 1875 by Archibald McMillan and Son, Dunbarton, and

13. The import of Peruvian guano into the United Kingdom alone reached a peak of 300,000 tons in 1858. William Gibbs and Company, the London associates of Gibbs, Bright, and Company of Bristol and Liverpool, had a monopoly for its import into Britain, and for varying periods also into the British Empire, the United States, and most of Europe. Demand for these cargoes was high enough to attract even the great clippers. Saturation of the market had begun to affect them too, and a number were starting, albeit reluctantly, to muscle in on what was, for them, a detested trade. At the time *Wallace* was there, over a hundred ships were gathered in the area waiting for their turn to come up at the loading chutes.

14. Wright, *Saint John Ships*, 69.

15. An interesting discovery about the spyglass was that its Liverpool manufacturer, Sewills, established there in 1800, is still active in the port. One of their products is a reproduction of their 1874 chronometer.



Captain Kennedy's last ship was the iron windjammer *Dunbritton*, shown here loading lumber for Australia at Port Blakely, Washington, in 1906. Beside her is the 1,398-ton Norwegian wooden barque *Excelsior*, in her day Norway's largest wooden merchant sailing vessel. Photo courtesy of the National Maritime Museum, Greenwich.

owned by John H. Watt and Company of Glasgow. These fine ships and their steel descendants were to form the rearguard in the fight against steam. *Dunbritton* left London under Captain Kennedy's command on 1 May 1876. She sailed via Wellington, New Zealand, which she left on 16 September, and arrived in San Francisco on 8 November.

It is tempting to imagine the captain taking out his spyglass as he approached San Francisco Bay and musing over his first voyage there as captain twenty-five years before, not forgetting the crew who had so proudly presented it to him. Captain Kennedy had only a short time to marvel over the stupendous changes that had taken place in the city in the quarter of a century since his first visit, for already on arrival he was quite ill. He died there of dysentery on 20 November 1876[16] at the age of sixty. By that time the electric telegraph was so well-established that *Dunbritton*'s owners in Glasgow received the sad news at noon on the following day.

16. *San Francisco Alta*, 22 November 1876.

Captain Kennedy was buried in San Francisco[17] and his name is commemorated in the local cemetery of his birthplace, Greenock, Scotland. It appears under an anchor symbol on one of the gravestones raised on the family plot that he himself had purchased as a young first mate, some thirty years previously.

17. Ibid.

Charles Dawson is a retired engineer, born in Liverpool, England, in 1921 and currently residing in Sweden. Since he first became interested in maritime history as a result of inheriting his great-grandfather's spyglass, Dawson has investigated the histories of all the vessels in which Captain Kennedy served, beginning with the wooden brig Salus *in which he first went to sea at the age of thirteen.*

News

New Permanent Exhibit Opens at Peabody

"Sailing for Pleasure: The History of New England Yachting," the newest permanent exhibit at The Peabody Museum of Salem, explores the significance of yachting in New England from its birth in 1816 to the present day. The exhibit, which opened on 7 November 1991, encompasses two separate galleries on the museum's second floor and includes not only artifacts from the museum's collections but also items lent by local sailors and yacht clubs. Among the exhibit's showstoppers are a 12-foot-tall sailing test model of the J-boat *Weetamoe*, a sterling-silver Tiffany punch-bowl trophy won by Boston in a 1906 intercity competition against New York, and a 23-foot cruising boat from the 1930s that has been authentically restored for the exhibit.

In the museum's Crowninshield Gallery, the exhibit focuses on the voyage of George Crowninshield's vessel *Cleopatra's Barge*. Launched in Salem in 1816, she has long been recognized as America's first yacht. Artifacts from the yacht and souvenirs from her maiden voyage document her cruise across the Atlantic and into the Mediterranean "on a voyage of pleasure." Visitors to the exhibit can enter a full-scale reconstruction of the *Barge*'s main salon and experience her richly appointed accommodations. An adjoining room traces the ancestry of the yachting tradition through models and prints of the *Barge*'s European predecessors.

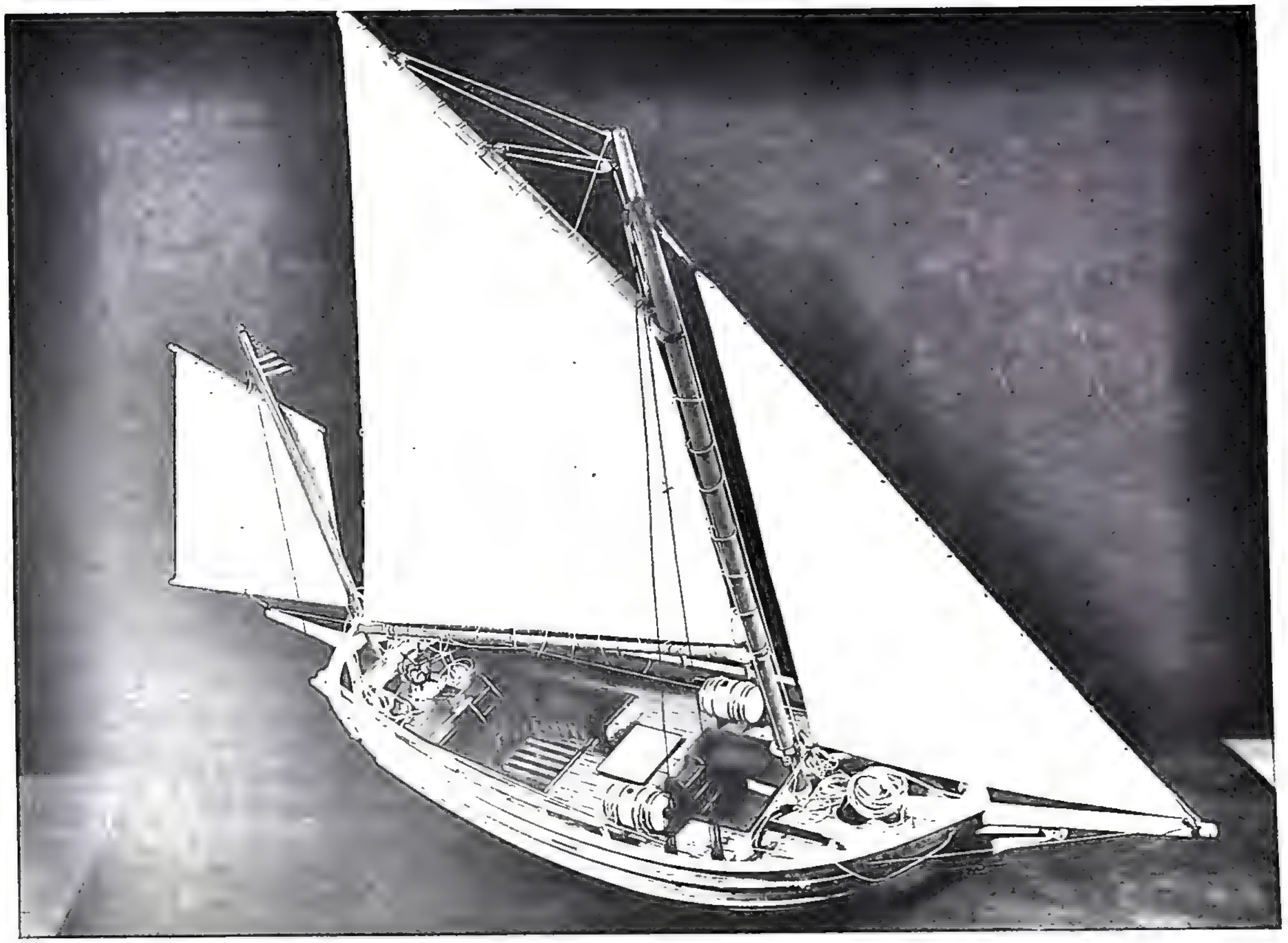
The main portion of the new exhibit is housed on the second floor of the museum's Dodge Wing. Here, the display focuses on New England yachting from 1830 to the present. Oil paintings and rigged models of period boats document the early years of yachting in New England. During the early and mid-nineteenth century, commercial workboat designs such as the fishing dory began to be adapted for pleasure use. One example in the exhibit is the oysterman design of the Atlantic coast, which was altered into an extreme racing design nicknamed the sandbagger, after the movable ballast required to keep the boat upright.

Paintings also depict the early years of yacht racing. A handsome period oil by Boston painter Clement Drew pictures *Raven*, built by Boston merchant Captain Benjamin Clark, winning the first race held in Massachusetts Bay in 1835. A Fitz Hugh Lane oil shows the schooner yacht *America* beating a fleet of British yachts in a race off the Isle of Wight in 1851 to carry home the cup that still bears her name. One of several oils by James Buttersworth brings to life the fury of the 1866 competition between three American yachts, *Henrietta*, *Fleetwing*, and *Vesta*, in a race across the stormy North Atlantic in which six crewmen were lost in heavy seas.

The exhibit also features lines drawings and half models that document the innovative yacht designs of such prominent leaders in the field as Edward Burgess, his son W. Starling Burgess, and B. B. Crowninshield of Marblehead; John Alden and his cousin Sam Crocker; and L. Francis Herreshoff, son of the Rhode Island designer Nathanael. Examples of the work of two Massachusetts Bay locals, C. Raymond Hunt and Ted Hood, carry this tradition of innovative design into the present.

Much of the success of yachting as a sport in New England results from the efforts of local yacht clubs, and "Sailing for Pleasure" also records the histories and contributions of such organizations as the Boston Yacht Club, Marblehead's Eastern Yacht Club, and the Manchester, Corinthian, and Jubilee yacht clubs. Photographs from the museum's archives as well as trophies won by top racers of the last century pay tribute to New England's most distinguished club-sponsored racing events.

Other displays focus on the development of racing as a sport and the different kinds of designs that evolved to meet the particular requirements of changing racing rules and one-design, formula-class, and handicap racing. The display of Marblehead Race Week, which at one hundred years of age is one of the nation's oldest racing events, represents the type of one-design racing that pits boats of "one design" against each other. The exhibit also documents regional and international events, made possible with the advent of seaworthy vessels capable of extended offshore passages, such as the Boston Yacht Club's Marblehead to Halifax Ocean Race, which started in 1939, and the Cruising Club of America's Newport to Bermuda Race, first run in 1906.



A model of the yacht *Spray*, the vessel which took Joshua Slocum on a solo circumnavigation of the globe in 1895-98, is one of the many artifacts now on permanent display in "Sailing for Pleasure" at the Peabody Museum of Salem, Massachusetts. Photo courtesy of the Peabody Museum.

The final segment of the exhibit centers around a 23-foot cruising boat built in 1932, the Sam Crocker-designed *Stonehorse Jr.* Crocker was responsible for many seaworthy, seakindly, and economical cruising designs, and visitors can view this representative example both on deck and below to gain insight into life aboard a small cruising sailboat. Around the *Stonehorse* are models of yachts used for cruising and exploration, perhaps the best known being *Spray*, in which Joshua Slocum circumnavigated the world alone. Artifacts collected by Cornelius Crane on his voyage in the Pacific aboard *Illyria* bring to life one of these cruising voyages. Together, the artifacts, trophies, models, photographs, and films featured in "Sailing for Pleasure" combine to create a definitive New England yachting exhibit.

Two WWII Exhibits Open

The National Archives Mid-Atlantic Region in Philadelphia, Pennsylvania, has opened an exhibition called "The Forgotten War: The United States Merchant Marine During WWII," which documents the vital role of the U.S. Merchant Marine during that war. The exhibit highlights Merchant Marine logbooks of vessels from the ports of Philadelphia, Baltimore, and Norfolk, vintage film footage, photographs, ship models, personal items of former merchant seamen, and other related artifacts. Admission is free. Call the National Archives at (215) 597-3000 for more information.

The Coast Guard Museum at the Coast Guard Academy in New London, Connecticut, has opened

"Sacrifice and Valor: The U.S. Coast Guard of WWII." The exhibit features paintings, photos, models, and artifacts of the Coast Guard's missions, ships, and people of the World War II era. Admission is free. For more information, call (203) 444-8511.

Naval Historical Center Fellowships

The Naval Historical Center, Department of the Navy, offers research support for established scholars, doctoral candidates, and undergraduate history majors undertaking research in U.S. naval history. Two research grants of up to $2,500 each are offered to established scholars; one fellowship of $8,000 is offered to a pre-doctoral candidate who is a U.S. citizen and has completed all requirements for a Ph.D. except the dissertation at an accredited graduate school; internships are available to undergraduate history majors who wish to spend up to four weeks engaged in applied history projects at the Washington Navy Yard. The grants and fellowship applications are due by 29 February 1992. Internship applications are due two months prior to the desired starting date. Applications can be obtained by writing to the Senior Historian, Naval Historical Center, Washington Navy Yard, Bldg. 57, Washington, D.C. 20374-0571.

New Curator at Calvert Marine Museum

The Calvert Marine Museum in Solomons, Maryland, has announced that Richard J. Dodds has been appointed curator of maritime history. Dodds comes to Calvert from the Chesapeake Bay Maritime Museum, where he was museum curator.

Survey of Cape Ann Fishing Vessels

A survey of fishing vessels operating out of Gloucester Harbor, Massachusetts, initiated by Mr. John Harper in 1988, has recently been completed. The survey, now housed at the Peabody Museum of Salem, includes photographic documentation as well as a data sheet for each vessel operating in the waters off Cape Ann. Vessel data sheets include the following information: document number as displayed on the vessel, home port, type of vessel (i.e. stern trawler, seiner, gill netter, etc.), vessel color, date of photograph, and sometimes gross tonnage, length, material, and age. Though many of the photographs are profiles, some are views of vessels hauled at a railway, rafted with others at a wharf, or in the process of being scrapped. All negatives are in 35mm format, and processed to archival standards.

The fishing vessel survey is expected to serve a number of purposes: as a historical reference of the Gloucester fishing fleet during the period 1988-1991; as an illustrative reference of the twentieth-century history of vessel design and fishing technology; and for vessel identification during Coast Guard search-and-rescue and law enforcement operations. Inquiries regarding the use of the survey should be addressed to Mr. John Harper, Photography Department, Peabody Museum of Salem, East India Square, Salem, MA 01970.

Titanic Exhibition at Mystic

Mystic Seaport Museum is hosting an exhibition designed by the Ulster Folk and Transport Museum in Belfast, Northern Ireland, entitled *"Titanic."* Combining original *Titanic* material with vintage photographs, recordings, newsreels, and music, the exhibition creates a sense of the era as well as the catastrophe in which almost 1,500 people perished. The exhibit will be open until April 19, 1992 — the eightieth anniversary of the sinking of the luxury liner in the North Atlantic. Call the museum at (203) 572-0711 for more information.

Great Lakes Research Collections Available

The Institute for Great Lakes Research at Bowling Green State University has recently completed a one-year project funded by the National Endowment for the Humanities during which four hundred cubic feet of manuscript, archival, and photographic materials documenting various aspects of Great Lakes maritime history were processed. Included are materials from the Lake Carriers' Association, the Loudon G. Wilson Collection, the W.G. Bartenfeld Collection, the International Ship Masters' Association Collection, the Wilson Marine Transit Company Collection, the R.A. Steam Collection, the Edward Middleton Collection, and the Paasch Marine Services Collection. Finding aids are available for these collections, and a special vessel list for the Loudon Wilson Collection will be available early in 1992. For additional information, contact Robert W. Graham, Archivist, Institute for Great Lakes Research, Bowling Green State University, 12764 Levis Parkway, Perrysburg, OH 43551, (419) 874-3907.

Book Reviews

CHRISTOPHER MCKEE, *A Gentlemanly and Honorable Profession: The Creation of the U.S. Naval Officer Corps. 1794-1815* (Annapolis, MD: Naval Institute Press, 1991). Cloth, 640 pages, 54 illustrations, appendices, bibliographic essay, endnotes, index. $46.95.

Christopher McKee's massive work is the first sociological survey of the American naval officer corps from its origins in the 1790s through the end of the War of 1812. As a balance to the traditional atomistic focus on famous naval officers, McKee seeks to supply a "social context" for the early officer corps. To do so, he has tracked dozens of application letters, traced grammar school careers, and found diary entries of hundreds of men, many now relatively unknown, from nearly two centuries' distance. McKee has been researching this book for more than twenty years, and readers cannot help but be impressed by the detail reflected in his endnotes and appendices. His was no easy task. *A Gentlemanly and Honorable Profession* is a major work, a remarkable piece of scholarship.

The book has a fairly rigid, *a priori* structure. After an engaging discussion of the office of Secretary of the Navy, from its physical layout to its organizational methods, McKee devotes the balance of the book to the type of men who became officers. He poses, then answers, the questions of who they were, where they came from, and why and how they became naval officers, then he treats broadly the society, education, sensibilities, fears, rewards, and career progression of the officer corps. There is a treasure trove of data in this book through which naval historians will be sifting for years, for although McKee's writing is clear and engaging, *A Gentlemanly and Honorable Profession* is written for historians and scholars.

The work contains, however, some sociological as well as historical shortcomings. First, the problem with percentages is that the author (and his readers) tend to lose sight of how small the absolute numbers are; generalizations are difficult when the population measured is as small as the U.S. naval officer corps in its earliest years. Even when the population is large, sometimes the statistics provided are not necessarily the most telling. For example, Professor McKee notes that only six of 885 midshipmen surveyed received a college degree (pp. 91-92), that one in five midshipmen had fathers who fought in the Revolution (p. 75), and that only thirteen men directly appointed as lieutenants in the Quasi-War with France had naval "careers" of seven or more years (p. 286). (Even so, what kind of "career" did James Barron have, listed here at a phenomenal "53.2 years," after June 22, 1807, and the *Chesapeake-Leopard* incident?) But the companion statistic, and probably the more important, would be the "excess" numbers (i.e., the numbers above the expected in the overall population). These are not given, nor are numerical comparisons made with the Army's officer corps.

Moreover, a clear, though implicit, assumption of *A Gentlemanly and Honorable Profession* is that being an officer was, or should have been, a career. That assumption begs several questions. McKee writes as if the ineluctable growth of the Navy was some transparent truth. The reality was quite different. It is rarely recalled — and McKee does not mention it — that the Act of April 21, 1806, limited the Navy to a mere nine hundred sailors, and even if the service was later expanded, the Navy was always suspect to the Republican Congress, and its very existence debated. Why would a young man have thought that the Navy would provide security, much less opportunity for his advancement, when Jefferson was elected President?

In addition, some of the numbers and some of the theories do not ring true. It is hard to believe (p. 219n) that both 15 to 20 percent of American sailors were black, and that more than one-half were foreign nationals; if that is true, less than one-third of American sailors were native white men. McKee "discovered" that the Navy came up with the rank of sailing master as a non-promotion track position to command gunboats so as not to "fritter away

its precious cadre" of lieutenants and midshipmen (p. 30-31). This was not the case with the commanders of the sixteen gunboats under Decatur at Norfolk during the war scare of July 1807, all of whom were lieutenants; but even if it were true, why would the Navy use sailing masters if, as McKee apparently believes (pp. 156-158 and 310), gunboat cruises helped educate its officers — another proposition that is contrary to traditional scholarship. One might also take issue with Professor McKee's supposition that officers believed in an egalitarian vision of America (p. 28). From his own description, they were quite clearly an aristocracy, with the sense of hierarchy that such a system implies. Indeed, they were "gentlemen" because they were the elite, not because they were mannerly — which many of them certainly were not. As gentlemen, they had a highly refined sense of honor. Dueling among officers captured contemporary and historical attention not, as McKee states, because of the spectre of death (p. 403); rather, dueling was endemic as the ritualistic expression of honor, the code of gentlemen.

There are some curious omissions. Despite a systematic analysis of the retention policies under the 1801 Naval Peace Establishment Act, McKee does not mention that young leaders such as John Rodgers were dropped altogether while some nincompoops were retained. It was ever thus; but McKee tries to show that merit was the guiding principle.

Despite such questions, McKee's work is a major contribution to the historical understanding of the U.S. Navy's officers. His use of abstract concepts such as "honor," "fame," and "deference," while sometimes debatable, leads to important insights, and his chapters on the shared experiences of weather and combat are beautifully written sections. His theory about the unspoken but general phobia which gripped American officers after the *Hermione* mutiny is provocative. Simply put, this is an important book on American sailing navy history.

FREDERICK C. LEINER

Baltimore, Maryland

EDWARD D. BEECHERT, *Honolulu: Crossroads of the Pacific* (Columbia, SC: University of South Carolina Press, 1991). Xi + 210 pages, maps, illustrations, notes, index. ISBN 0-87249-719-4.

Pearl Harbor and Waikiki are probably better-known to the American public than the port city of Honolulu located between the naval base and highrise tourist playground. In the rich historiography of Hawaii, little attention has been given to the capital city itself by social, economic, or maritime historians. Gavan Daws' massive Ph.D. thesis of 1966 remains unpublished. This book, by noted labor historian Edward D. Beechert, is therefore highly welcome, even if, regrettably, its focus has been trained too narrowly on the port of Honolulu rather than on the town/city as a whole. The limited scope of the book, not directly suggested by its title, is all the more disappointing, as there are several passages where the author appears to be interested in discussing broader themes than the physical development of the harbor and its facilities and the endless financial, administrative, and political squabbles which accompanied its evolution.

The chapter dealing with maritime labor, while drawing heavily on Beechert's earlier writings, provides a concise yet penetrating overview of the struggles of Hawaii's waterside workers to get organized and, by 1949, to be employed on the same conditions as west-coast longshoremen. The role of Australian-born Harry Bridges is properly emphasized but does not overshadow the fundamental strength emanating from the men's own inter-racial solidarity and their capacity to produce inspiring leaders. There is no attempt, however, to give a social dimension to either wharf labor as such (or, for that matter, the small coterie of merchants who controlled Hawaiian political and economic life for so long) or the multi-ethnicity which was and is so characteristic of Honolulu. Similarly, after the more or less forced toleration of prostitution and liquor after 1825, the subject of "sailortown" is dropped from the agenda. One sorely misses a conceptual introduction to such issues which directly touch the nature and structure of the book.

Accepting that the book is based principally on the narrowest definition of "port" or "harbor" (the two terms are not identical), it should have contained a thorough discussion of the waves of Asiatic and western immigrants, if only because the kingdom's Immigration Depot, subsequently the U.S. Immigration Station, figures largely on all maps reproduced in the volume. The same could be said for the tourists and others arriving on passenger liners. In a different sphere, there is no discussion of the impact of the changing shape of the port on the overall morphology of Honolulu — somewhat curiously, as Beechert does discuss the "fanciful" Moanalua project of Samuel Damon (pp. 103-104).

On the physical and administrative aspects of the port and harbor, however, Beechert provides many pertinent insights. Overall, his assessment of its performance and significance is based on a sound appreciation of the volume and nature of the shipping

using Honolulu. He demonstrates that, after the initial period of triangular traffic with the American northwest coast and China, and besides its function as a supply base for whalers, Honolulu had little or no potential to become a regional hub of shipping; in that sense, the book's subtitle "Crossroads of the Pacific" clearly overstates its importance. A more systematic discussion of the merchant fleet which was based at Honolulu could have strengthened the point. By contrast, Pearl Harbor and the many other non-naval military installations on Oahu could strategically justify the book's subtitle, but that argument is, in fact, not made. Indeed, the naval role of Honolulu since its annexation by the U.S. is only touched on insofar as it led to more business for the commercial harbor; no mention, for example, is made of the Washington Naval Limitation Treaty which specifically excluded Hawaii from the western Pacific non-fortification zone.

As Beechert convincingly demonstrates, the most recent proof of Honolulu's false claims to a regional role as commercial port was the failure of the Matson Line to slot Honolulu into the transpacific network of modern containership services. Beechert dissects this failure clinically, but he should have given more critical attention to the long-lasting Sydney-San Francisco services, via Honolulu, of the Pacific Mail Steamship Company; the Union Steamship Company of New Zealand until 1900, when Hawaiian annexation made it impossible for non-American companies to operate between Honolulu and the mainland; Spreckels' Oceanic Steam Ship Company; and, finally, the Matson Line. (It was this shipping line which meant that Duke Kaahamanu could have the astounding impact on Sydney which soon made Australia one of the main surfing nations.) On the other hand, in no other source have I found mention of the steamer *Oceanic*, which was the first to enter the recently dredged harbor in May 1893 (p. 88); presumably one of Spreckels' Oceanic Steam Ship Company's vessels was involved. In 1925 Matson, itself controlled by four of Hawaii's "big five" firms, took over the Inter-Island Steam Navigation Company. While Beechert acknowledges this step towards its "awesome level of concentration" in the islands' shipping industry, he fails to mention the purchase of Oceanic in the next year. That purchase, with the not unrelated demise of the Los Angeles Steamship Company in 1930, completed Matson's grip. Only the explosion of military activity and tourism after World War II was able to break open the oyster that was Hawaiian shipping and trade.

In its narrow mission as a port history, *Honolulu* is informative and largely successful. It is a welcome, albeit not innovative, addition to the literature on American ports. It is a pity that no attention is given to the establishment of the Hawaii Maritime Center and the return of Matson's *Falls of Clyde* as a museum ship. As so many other ports with derelict and otherwise commercially unusable land and water space, celebration of the maritime past is intended to generate tourist income but, regrettably, very few of the exhibits say anything about Honolulu as a port or as a human community. A history of Honolulu as port city still stands on the historical agenda.

FRANK BROEZE

The University of Western Australia

CHARLES A. BARTHOLOMEW, *Mud, Muscle and Miracles: Marine Salvage in the United States Navy* (Washington, D.C.: Naval Historical Center and Naval Sea Systems Command, 1990). 7" x 10", cloth, xxiv + 505 pages, drawings, diagrams, photographs, maps, appendices, bibliography, index, tables.

The marine salvage community in the United States Navy is one of those specialist branches of the service which is either overlooked or treated as a repository for colorful characters too rough and uncouth for general line-career tracks. Like the mine warfare command or the Seabees, the salvage branch will probably never produce a fleet admiral or a chief of naval operations, yet it does valuable and essential work. Moreover, there have been times when its officers and men have held center stage and have been the determinants of success or failure in dramas as diverse as the saving of the crippled cruiser *Houston* or the recovery of the fragments of the doomed space shuttle *Challenger*.

The Navy's salvors have their popular historian in the person of Rear Admiral Edward Ellsberg, whose books combine detailed technical narratives with hair-raising stories of acute personal danger and seat-of-the-pants improvisations required to accomplish a wide variety of complex salvage jobs. A reading of Ellsberg's books imparts a deep appreciation for the character of military marine salvors, especially their qualities of tenaciousness, ingenuity, independence, and irreverence towards all things formal and ceremonial. In perhaps no other branch of the service do officers and enlisted men work together so closely or depend on each other so completely. They all roll up their sleeves and get their hands dirty, and everyone has to know exactly what the other is doing.

Ellsberg's books capture this spirit admirably, but they do not serve as a connected history covering the whole sweep of the Navy's experience in the field of marine salvage. To fill this need, the Naval Historical Center commissioned Captain C.A. Bartholomew to compile what amounts to an official history extending essentially from World War I to the present. Like all works of this type, *Mud, Muscle and Miracles* eschews color and drama in favor of thoroughness and the documentation of institutional development. Brief accounts of every major salvage effort undertaken by the Navy are included, but the real emphasis is on the evolution of the marine salvage command, the development of relationships with civilian specialist contractors, the expansion of the service to meet the needs of war, and a steady increase in the scope of responsibilities assigned to the Navy's salvors. These include recovering lost aircraft, rescuing civilian research submersibles that have become disabled on the deep ocean floor, and locating and retrieving lost nuclear warheads, just to name a few.

Due to its rather dry official tone, *Mud, Muscle and Miracles* somewhat belies the promise of its title. Those purchasing this book will probably prefer to use it as a reference rather than reading it through from cover to cover. A thorough reading will produce its share of rewards, however, including little-known facts about the capsizing of the *Normandie*, which was apparently lost because New York's Mayor La Guardia, after determining that nobody else, including President Roosevelt, was willing to accept responsibility for her, allowed his firemen to endanger her stability rather than risk letting her fire spread to the rest of Manhattan. Another shocker revolves around the amazing daring and effectiveness of Vietnamese communist sappers, who attached limpet mines to several large freighters and tankers and at least one aircraft transport and sank them in the rivers and harbors of South Vietnam. These intrepid swimmers gave the Navy's salvors many headaches and added immeasurably to the cost of the war.

The comprehensiveness and scope of this book will surely make it the standard reference on the subject of Navy marine salvage, one that will provide researchers who want to explore individual incidents in more depth with their initial gloss on their chosen topic.

JAMES E. VALLE

Delaware State College
Dover, Delaware

JOHN MCPHEE, *Looking for a Ship* (New York: Farrar, Strauss, and Giroux, 1990). 8½" x 5¾", cloth, 242 pages, no illustrations, appendices, or notes. $18.95.

Unlike most writers whose works grace the pages of *The American Neptune*, John McPhee is not primarily a student of maritime affairs. He is an author who has written about the pine barrens of New Jersey, the Alaskan wilderness, and oranges, among other topics. In *Looking for a Ship*, McPhee takes us on a remarkable voyage to the third world, exploring the personal lives of modern sailors, the drudgery of much of seagoing life, the terrifying moments of pirate boardings, and countless other subjects of the sea. He brings what I. B. Stone called the "outside eye" to bear on the failures and triumphs of the U.S. Merchant Marine and a small group of its participants.

The author and his friend Andy Chase, after looking for too long, find in Charleston, South Carolina, the *Stella Lykes*, a container ship bound for the west coast of South America. Chase becomes the second mate and McPhee rides his coattails, but he gets to know many of the other crew members, both licensed and non.

We join the ship when she is south of the equator between Guyaquil and Valparaiso, and here we are introduced to Captain Washburn, a man who talks to his ship and is purported to be the most interesting person aboard. Earlier in the voyage he had summoned to the pilothouse a horse trainer named Carlos who was accompanying twenty-four thoroughbred racehorses from Panama to Ecuador. The captain expressed concern that the animals were not being fed enough because the crew had discovered that a good deal of wood in their stalls had been consumed. But Carlos refused the captain's offer of 120 ears of corn, saying that his horses did not eat corn. Captain Washburn's sarcastic and resigned response was translated into Spanish by the author for Carlos — it is a wonderful moment, surpassed only by Carlos' later fate between the jaws of a hungry two-year-old.

McPhee uses humor in describing the food as well. "The pork chops may be cobblestones, the salmon steaks taxidermy. But the turnip greens, black eyed peas, the kippers, the catfish, the boiled smoked ox tongue with mustard sauce do not deserve to be called inedible. They tend to explain why so many in the crew have the silhouettes of shucked clams."

No stone is left unturned. McPhee tells us how the Andes are being formed as he sails by them. He explains in (at times numbing) detail that the ship is carrying such things as fluorescent tubes, steel angle, common clay, graders, cellulose acetate flakes, and chewing gum base,

but he leaves some items of the cargo, like "hot leftovers," unexplained. He tells us of the reputations of the various ports the ship enters. And he gives us countless sea stories from the lips of sailors who have been going to sea since World War II.

McPhee's thorough coverage extends beyond the voyage itself. For instance, we learn that before the voyage begins he is staying with Andy Chase's mother-in-law near Charleston. Afterwards, he plays golf with Captain Washburn. In Buenaventura he rides into the mountains in a taxi with one of the engineers. Occasionally the author provides too much detail, such as the air temperature and relative humidity as the ship lies at anchor in the Guayas River under heavy guard after a hair-raising pirate attack. At another point, conversely, we get only a hint of the tragic fate of three stowaways who had crawled into the number four hold and apparently expired from the heat.

Above all, the volume is about men's love and hate for the sea. Through Callao and Buenaventura and the Panama Canal, the author digs and twists at the crew, uncovering their fantasies and hobgoblins. Captain Washburn, for example, was a former hobo, boxer, and circus rider, who was hooked on the sea by 1945. It was his escape. Andy Chase is a direct descendent of Nathaniel Bowditch and seems to have a congenital predisposition toward the sea. But some of the crew go through each day with their teeth clenched, so much do they hate their work. They are older, more stable, and better educated than crew in the past. They have families and shoreside hobbies that interest them and draw them home.

It is also the story about the decline of the American-flag fleet. By the end of the book, the *Stella Lykes* has lost power and is drifting haplessly somewhere west of South America. Only the greenest novice will need an explanation of this metaphor: that the Merchant Marine, like the *Stella Lykes*, is dead in the water. Not surprisingly, much of the sailors' conversation throughout the voyage is filled with invective against low-cost foreign shipping, the "fish heads and rice" crews from third world nations, and the lack of action by the American government to correct the situation. It sounds an awful lot like the stuff of union newsletters, and depending upon one's viewpoint on the subject, may be discounted or held up as gospel. Even the author falls for this a bit too much, as when he claims that "because flag of convenience ships are essentially unregulated, they have led a trend toward compromised safety and the lowest practicable levels of operation and maintenance." In so doing, they have dragged others down with them, he says, uncharacteristically glossing over a complex scenario.

This is a small complaint, however, dwarfed by the imagery and information presented. Taken together, *Looking for a Ship* is a marvelous account, a first rate adventure. Historians, academics, and policy makers will find it rewarding, as will the general reader for whom it was intended. Sadly, however, though our appetites may be whetted for more, we might not get it. Judging by his past, McPhee will now turn his attention to a new subject, leaving us to savor what he has left. Our gain is our loss.

MARK ASPINWALL

London, England

GERALD E. MORRIS AND LLEWELLYN HOWLAND III, EDS., *Yachting In America: A Bibliography Embracing the History, Practice, and Equipment of American Yachting and Pleasure Boating From Earliest Beginnings to Circa 1988* (Mystic, CT: Mystic Seaport Museum, 1991). 7" x 10 ½", cloth, x + 398 pages, index.

Gerald Morris, Librarian of the G.W. Blunt White Library at Mystic Seaport, and Llewellyn Howland, yachting historian and an antiquarian marine book dealer, have produced a long-anticipated compilation of titles on the subject of American yachting and recreational boating.

One of the delightful and, unfortunately, rare features of this volume is an excellent introduction in which the editors take meticulous pains to delineate and explain the scope and parameters of their work. Morris and Howland point out that there are no preceding compilations of titles on American yachting. Their work is based on the extensive collections held by the G.W. Blunt White Library, the New York Yacht Club Library, the New York Public Library, and titles included in the *National Union Catalogue* and other reference sources. The two editors concentrated on yachting and recreational boating in America, because the other major bibliography on the subject, produced by the Royal Cruising Association, is currently being updated and will cover British and other European areas.

The author/title master list in *Yachting in America* covers 159 pages and includes only book-type publications. The editors decided not to include periodical literature, which may be a mixed blessing. Many of the articles appearing in popular periodicals contribute little to the overall body of knowledge; however, there are a few which may be considered seminal and would be worthy of inclusion in a bibliography on yachting.

Once past the overall listing by authors, Morris and Howland undertake a prodigious effort of arranging these titles into thirty-five subject areas, including Biographies and Memoirs, Club Histories, Cooking, Cruising Guides, Etiquette, Humor, Power Boats and Boating, Racing, Yacht Biographies, and other subjects. Herein may be one of the real values of this work. A number of truly interesting accounts of voyages and adventures were privately printed and exist only in highly specialized repositories. The general reader's only tool to those works is a bibliography such as this. One example is Samuel L. Clemens' *Mark Twain. Able Yachtsman. Interviews Himself on Why Lipton Failed to Lift the Cup* (1920). These works surface readily in the editors' subject scheme and they should provide readers with hours of lively entertainment.

Yachting In America concludes with a useful cross-index by coauthors (although Walter Cronkite is mysteriously omitted in this section), and this is followed by an index arranged by names of boats.

For those who desire to overdose on America's Cup literature and lore, Morris and Howland provide fifteen pages of books on this popular subject. Included are all the New York Yacht Club reports and issuances on rules, challenges, and races while the cup was in that organization's possession.

This bibliography belongs on the shelves of every yacht club and in the collections of serious students of recreational maritime pursuits. It is well-conceived and well-organized, and the bibliography's true value is that the subjects it highlights are easily accessible.

RICHARD A. VON DOENHOFF

Bethesda, Maryland

JAMES D. TRACY, ED., *The Rise of Merchant Empires: Long-Distance Trade in the Early Modern World,* Studies in Comparative Early Modern History (Cambridge: Cambridge University Press, 1990). Cloth, xviii + 442 pages. $44.50.

Like all collections that come out of conferences, in this case thirteen different contributions from a meeting held at the University of Minnesota in October, 1987, there are differences in focus and value among the papers. The generally high quality of the papers and the consistent clarity in presentation set this volume apart. A second volume on the political economy of merchant empires, using papers from the same conference, is promised. The overriding question attacked in this collection is why, in the end, did the English and the Dutch win the prize of the long-distance carrying trade in the world, and especially that between Asia and Europe, by 1750? Was it superior business methods? Was it superior organization in large companies like the Dutch and English East India Companies? Was it superior transport technology, or better sailors? Was it superior methods of visiting violence on competitors, or was there some other reason for the success of Europeans? The Danish scholar Niels Steensgaard's essay reaffirms the conclusion of his earlier book that, when northern European companies entered Asian trade, they brought with them different business methods which revolutionized trade. Earlier Iberian traders had simply fit into existing structures. Steensgaard's influence is most direct in his own essay on the composition of the Dutch and the English Asian trade, but it is also apparent in other essays: J.R. Bruijn's on the relative shipping costs for the two East India Companies, Carla Rahn Phillips' on trade of the Iberian empires, Herman van der Wee's on the structure of long distance trade in Europe, Paul Butel's on the rapid growth of French overseas trade in the eighteenth century, and Herb Klein's on the eighteenth-century Atlantic slave trade, as well as in papers on overland caravan trade, like Morris Rossabi's on central Asian and Ralph Austen's on trans-Saharan trade. His influence is less obvious though clearly behind the essays dealing with merchant communities, like those of Wang Gungwu on Chinese sojourners in Japan and the Philippines, or Irfan Habib on precolonial Indian merchants, or Frederic Mauro on merchant communities in general. The remaining two chapters by Ward Barrett, on international bullion flows, and Larry Neal, on prices of Dutch and English East India Company shares, play less of a direct role in dealing with central issues of the volume.

The volume presents a wide range of work and shows the state of study on worldwide trade in the period. The notes offer an excellent listing of what has been done and is being done at present, which makes the lack of a summary bibliography even more unfortunate. Many of the individual essays, for example Klein's on the Atlantic slave trade and van der Wee's on European trade, are excellent and readable summaries of the state and direction of study. Phillips especially is able to show how, over the period, international shipping developed an economic interdependence among different parts of the world and among merchants from very different backgrounds and traditions.

The analysis of the early interaction between Europeans and Asians is, as the editor hoped, not colored

by the racist and imperialist ideas which dominated much of earlier historiography. All the authors submit to the view that, from earliest contact until the nineteenth century, there was something more like cooperation between the partners in long-distance trade rather than efforts at imperialist domination by Europeans.

The tables and maps in the volume are not consistent with the level of scholarship and editing. The nine sketch maps are inadequate. The tables, which are reproductions of typed texts, are not all easy to follow. The authors make a conscious effort to create comparable statistics, although not always successfully. Steensgaard especially explains the problems of trying to deal with different measures, and he makes a start in identifying the long-term swings in profits and sources of competitive success of the two big companies to produce a general quantification of early modern international trade. Undoubtedly, he is right that it can be done, but whether there is the conviction and the resources to carry it out remains to be seen.

Although the ultimate goal may not have been achieved in this single effort, there are many valuable results. Bruijn, for example, is able to show that the Dutch East India Company was far from being stodgy and conservative, keeping pace with English competitors in all ways until the 1780s. Barrett's extremely careful effort to estimate total silver production in the New World, and the destinations of that silver, must serve as a starting point for any further discussion of New World trade and of prices in Europe during the so-called price revolution. Together, the essays offer an introduction both to the most important issues in the study of early modern European international trade and also a survey of the state of scholarship. In general, they are refreshingly readable. The second of the two volumes will be hard-pressed to match the standard set by this one.

RICHARD W. UNGER

University of British Columbia

HERVEY GARRETT SMITH, *The Arts of the Sailor: Knotting, Splicing and Ropework* (New York: D. Van Nostrand Company, 1953; reprint New York: Dover Publications, 1990). 5¼" x 8½", paper, viii + 246 pages, index, 101 illustrations. $6.95.

When first published nearly forty years ago, *The Arts of the Sailor* was clearly intended as something more than a nostalgic exercise. The postwar boom in recreational boating found many new converts on the water, some ill-prepared for the myriad hands-on experiences peculiar to sailing craft, large and small. It was with a clearly defined sense of mission that the author, armed with a ready wit and a veritable seabag full of personal experiences to relate, undertook to promote the traditional shipboard practice of marlinespike seamanship to a new generation of sailors.

While some of the material covered in the book is strictly aesthetic — like the fashioning of turk's head and other decorative knots — the majority of the work deals with practical matters. Beginning with a careful explanation of the construction and characteristics of rope and cordage, the book carries the reader through increasingly sophisticated and useful applications of knots, bends, hitches, and splices. Functional and decorative canvaswork as it relates to ropework is also covered, again with an emphasis on shipboard practicality. At every turn, the author's crisp drawings provide a wealth of information of particular importance to the newly initiated.

If *The Arts of the Sailor* has a weakness, it is the fact that technology has revolutionized yachting to a degree undreamed of in 1953. With the exception of a brief mention of the then-new wonder fiber nylon, the book deals almost exclusively with manila, hemp, and cotton. In the past few decades, however, synthetic materials have changed the appearance and performance of shipboard gear. The strength of the new Kevlar-core lines, for example, was unthinkable just a few years ago.

In an age of carbon composite racing machines, computer-designed rigs, and satellite navigation systems, is there a niche for *The Arts of the Sailor* besides the backwaters of a dusty bookshelf? The answer to this is yes, and the proof can be found in the resurgence of interest in traditional small craft designs. Along with this revived popularity of older designs has come a renewed appreciation both of traditional materials like manila, hemp, and cotton, and of their various uses. To yet a new generation of sailors, the shipboard arts so lovingly detailed and illustrated in this book provide a fitting complement to the graceful hulls and rigs now reappearing on waters around the world.

RICHARD C. MALLEY

The Connecticut Historical Society

PHILIP S. DAWSON, *British Superliners of the Sixties: A Design Appreciation of the* Oriana, Canberra, *and* QE2 (London: Conway Maritime Press, 1990). 10¾" x 7¾", 160 pages, 100 photographs, 40 line drawings and plans. £20.

This slim volume offers us a concise design history of three of the best British liners built in the post-World War II era. Although this is his first full-length book, Dawson is a well-known free-lance writer who has specialized in passenger liners. This helps to explain why Sir Hugh Casson, who served as an architect on both *Canberra* and *Queen Elizabeth 2*, agreed to provide the foreword to this book.

The book is divided into nine clearly defined chapters. The first two provide background information on the history of passenger ships, and details on the design process. The third chapter focuses on the design and construction history of the *Oriana*. At this point, the author informs us that the name Oriana was utilized whenever Tudor poets and writers wished to refer to Queen Elizabeth I. He also notes that the *Oriana* and the *Canberra* can be described as being half-sisters, despite being owned by different firms. The next two chapters detail the design history of the *Canberra*. The story of the construction and design of the *Queen Elizabeth 2* occupies the following three chapters. In the last one, Dawson examines the collective influence of these three vessels on the post-*QE2* generation of liners.

Dawson has thoughtfully provided three appendices which help to further the reader's familiarity with these ships. The first of these is a detailed technical description of the three vessels studied in this volume. The second offers a very simplified technical description of those commercial and other passenger liners which are frequently mentioned in the main text. The last one offers a detailed route analysis for one of the *Canberra*'s typical voyages.

This volume is profusely illustrated, with both official and the author's personal photographs of these ships. The reader should note that Dawson has made several voyages on both the *Canberra* and the *QE2*. The line drawings which he has included in the text are more than adequate for the general reader. Some of them, however, are not scaled, particularly those which emphasize equipment details.

One strong point of this volume is the author's ability to explain technical and complicated construction and design processes in a very clear and concise manner. Two examples of this are his description of "bi-metallic joints" and his explanation of the factors which determined the shape of *QE2*'s funnel. He has also managed to trace both the impact of previous designs on these ships and the subsequent impact of their designs on future vessels.

One major drawback is the unfortunate result of Dawson's determination to limit the scope of this volume to the design history of these ships. He does not discuss the various changes in role or the structural modifications made to these ships throughout their careers. While this is certainly understandable to a degree, it severely limits the utility of the book. In addition, Dawson does not offer many insights as to what the future may hold for the two remaining active members of this trio.

Despite these minor shortcomings, this book is both well-written and very informative. Dawson's enthusiasm for these vessels is readily noticeable and very contagious. The reader should be aware that, despite his fascination with these vessels, the author made every effort to offer a balanced assessment of their place in the history of passenger ships. *Superliners* should be read by anyone interested in either the history of these three ships or of passenger ships in general. In addition, past, present, and future passengers of both the *Canberra* and the *QE2* should find this book very enlightening.

PETER K. H. MISPELKAMP

Pointe Claire, Quebec

JOHN R. SIMMONS, *Campaign Ribbons* (Manhattan, KS: Sunflower University Press, 1990). Paper, 188 pages. $14.95.

The *Campaign Ribbons* in this volume's title are the service ribbons earned by its author during World War II. The book is Simmons' memoir of his experiences during that conflict.

John Simmons was a British citizen and a junior assistant purser with the Canadian Pacific Steamship Company, serving on the run between England and Canada, when Hitler struck Poland. He and his ship, the posh HMS *Empress of Australia*, were in Quebec when war broke out. Both returned to England to be incorporated into the Navy, Simmons becoming a Paymaster Sub-Lieutenant, Royal Navy Reserve. For the first few months, he and his ship made troop-carrying runs to India and from Canada. Early in 1940, they were reassigned to the gathering forces for operations in northern Norway. In April and May, they were present in Namsos and Narvik.

Sometime later in 1940, the author was reassigned to a small, old, coal burning former liner, HMS *Hilary*, outfitted as an "Ocean Boarding Vessel," whose mission was to intercept enemy merchant ships and contraband heading for German-controlled ports. She spent several uneventful weeks filtering merchantmen heading for the Western Approaches until April 1941 when, in the space of a week, *Hilary* intercepted and took prize two small Italian tankers.

In the fall of 1941, Simmons was reassigned to HMS *Keren*, another former liner converted to an amphibious assault headquarters ship. Sailing from Scotland in early 1942, she was a part of a British force sent to gain control of the strategically important French island of Madagascar. She landed troops on the northwestern coast on 5 May; they encountered only sporadic opposition in gaining their objective in about 48 hours. The ship then carried African troops from Kenya to Egypt via the Red Sea before returning to Scottish waters around the Cape of Good Hope.

The fall of 1942 found HMS *Keren* involved in the workup and then the invasion of French North African territories (Operation "Torch") in November. The approach and landings encountered little opposition, and the ship was soon moored quietly in the former enemy harbor. A shipboard accident prevented her participation in the subsequent Tunisian landings. Upon her return to Scotland, Simmons was promoted to Lieutenant (S) ["Supply and Secretarial Branch"].

Keren's next assignment was to carry replacement troops to India. She was overhauled in Bombay, then went to Port Suez to provide shipboard training for Gurkha and other troops in preparation for future amphibious operations. For *Keren* and Simmons, that operation was "Husky," the invasion of Sicily on 10 July 1942.

Not quite two months later, with *Keren* again in an Egyptian port, Simmons received orders back to England for training prior to his new assignment: officer in charge of aviation stores on an escort aircraft carrier then completing on the West Coast of the United States. HMS *Trouncer* was commissioned in February 1944, about two months after Simmons met the American Wave Lieutenant (jg) who later became his wife. Following a post-commissioning availability in Vancouver, *Trouncer* passed through the Panama Canal and picked up a load of aircraft in New York for transport to England. She was then employed in training aviators of the Naval Air Arm.

Following the invasion of Normandy, *Trouncer* left carrier training to transport aircraft from the United Kingdom to India and from the United States to Morocco. She was so employed at Germany's surrender, and was in Belfast being outfitted for Pacific service when Japan capitulated. Simmons remained in the ship as she made a round trip to Sri Lanka in the fall of 1945, and he was one of the reduced crew that returned *Trouncer* to the U. S. Navy at Norfolk, Virginia.

The author writes well but with imprecision as to dates and details. One gets the impression that he never became emotionally or intellectually involved in his wartime service. His memories of the various operations and events at which he was present leave one with the feeling that he viewed it all from afar, generally aware that "something" was happening but not on intimate terms with it. This feeling is somewhat confirmed by his expressed impatience, even at this late date, with having had to learn such basic "all hands" skills as aircraft recognition and damage control. Perhaps some of the best passages are those describing the several country clubs in Portland and Vancouver whose facilities were used to house transient British officers while their ships were readied. Mr. Simmons, of course, had a career in club management after leaving the Royal Navy and emigrating to the United States in 1948.

A brochure accompanying the book indicates that the publisher has already produced about a dozen such memoirs. This is the only one with a naval theme; most appear to deal with lesser-known aspects of World War II. One hopes they provide more enlightenment than the volume reviewed.

TYRONE G. MARTIN

Tryon, North Carolina

F. ROSS HOLLAND, JR., *Great American Lighthouses* (Washington, D.C.: The Preservation Press, 1989). 5¼" x 10¼", paper, 350 pages, 420 photographs, many drawings, index. $16.95.

This interesting and extremely useful book tells the story of what has happened to a well-known and much loved feature of American life — the lighthouses operated by human hands, all of which have been made obsolete by automation. The beloved lighthouse keeper, who conscientiously cleaned the big Fresnel lenses, lighted the lamps, and saw to it that they operated correctly, is gone, replaced by electricity managed by a computer-operated program hooked up to a timer.

Ross Holland has put together a detailed study of about three hundred significant lighthouses, illustrated with countless pictures. Holland has been aided and abetted by

Senator George J. Mitchell, a Down Mainer who proudly hails his part of the world as "The Lighthouse State" because he estimates that the rugged coast of Maine has had more than sixty lighthouses. *Great American Lighthouses* serves as a tribute to American lighthouses but also as a celebration of the two-hundredth anniversary of the Lighthouse Service in 1989. President Washington signed the act creating the Lighthouse Service on August 7, 1789. "This statute," says Senator Mitchell, "can be characterized as the first public works law in the nation." Actually, by the time the statute was signed, about ten lighthouses extending from New England to Georgia had been built with private funds, largely as a result of pressure from shipping interests. New Englanders can take pride in the fact that the first lighthouse in our country was built in 1716 in Boston Harbor.

There are some wonderful touches in the book. For instance, there is a tribute to the trials and tribulations of the wives of the keepers of the light. These women were cut off from the world in many cases, and they or their husbands would have to row the youngsters some distance to get them to school each day. Holland also points out that replacements for Fresnel lenses are now cast in plastic, using the genuine Fresnel lenses as molds. For those who wonder what happens when a light bulb goes out in an automated light, Holland explains how a gadget automatically moves the dead lamp along and a new replacement light goes into its place.

In researching his book, Holland was fascinated by the varied architectural styles of lighthouses. Many were more than just a stone shaft with a light on top. His research also brings a note of sadness about the neglect and vandalism that has befallen many a light no longer in service. Too bad that more lighthouse installations have not been preserved in the manner of that at St. Simons Island in Georgia, operated by the Museum of Coastal History, where the light has been automated but the keeper's house is a lighthouse museum. The tower is open to visitors and the oil-storage shed is a gift shop. As such, the lighthouse does the useful work for which it was intended and at the same time gives visitors a look at the light's many years of faithful service, whether illuminated by oil or by today's automated procedure.

Ross Holland's book has a comprehensive history of lighthouses, scores of pictures, and thumbnail sketches of each important light pictured. Unfortunately, it suffers from an improper binding, which makes it hard to read and even harder to use as a reference volume because it wants to snap shut the minute the reader stops holding it. Reference books that sit flat on a desk are so much easier to use (or review). However, it is a fine guide to take along on a car or boat trip on the East or West Coasts, the Gulf Coast, or the Great Lakes.

JOHN R. HERBERT

Spring Hill, Florida

BRIAN LAVERY, *Building the Wooden Walls: The Design and Construction of the 74-gun Ship* Valiant (London: Conway Maritime Press, 1991). 10¾" x 7¾", cloth, 208 pages, 125 illustrations, bibliography, index. £25.

This work supplements earlier volumes from the knowledgeable pen of Brian Lavery, notably *The Ship of the Line*, Volumes 1 and 2 (London and Annapolis, 1983-4), and *The 74-gun Ship* Bellona, (London and Annapolis, 1985).

Although Chatham Dockyard was phased out by the Admiralty in 1984, its memory is kept alive by an exhibit on the same site, the Chatham Historic Dockyard, which is well worth the attention of the maritime-minded visitor to the London area. Brian Lavery is on the staff of this institution, and, consequently, his interest focused on the 74-gun ship *Valiant*, which was built in a dry dock there. This book is her story. She was commissioned in the year 1759, built as a copy of the French 74-gun *Invincible*, which was captured in 1747 and sank in 1758. She in turn is the subject of Lavery's *The Royal Navy's First* Invincible, (Portsmouth, 1987), and the present work contains several photos of artifacts recovered from the wreck.

The 74-gun ship was the backbone of the Line of Battle from the mid-1700s through the early 1800s, for reasons well set out by the author. In the early 1700s, the period of the "Establishments," the Royal Navy had Ships of the Line of 100, 90, 80, or 70 guns. The 90s were well-armed but clumsy sailers, and the 70s, nimble enough but carrying nothing heavier than 24-pounders, could not throw sufficient metal to discourage a more heavily armed enemy. The 80s had three decks like the larger vessels, and this resulted in their being too high for their length, inherently unstable, and poor sailers. The Admiralty were sufficiently impressed with the abilities of *Invincible*, and three other French 74s taken the same year, to order two ships of this class in 1757, one being *Valiant*. The satisfactory results of the experiment ultimately persuaded the authorities that the 74, with its two-and-one-half decks of guns, was the ideal compromise, and gradually this design replaced the three-deck 80-gun and the two-deck 70-gun classes in the Line.

The new 74s were armed on the lower gun deck with a full battery of 32-pound cannon. Analysis of the damage inflicted in action showed conclusively that a few heavy guns were better than many small ones, and in practice the 32-pounder was the most effective weapon overall. Larger caliber cannon were found to be too cumbersome when in action, while the destructive power of the 24-pound ball was insufficient. According to one contemporary authority: "The 74 gun ship contains the properties of the First Rate and the Frigate. She will not shrink from an encounter with a First Rate, on account of superior weight, nor abandon the chase of a Frigate on account of swiftness."

Why was this successful prototype initially developed in France rather than in England? The author points out that the French Marine set up their School of Naval Architecture seventy years before a similar move by the Admiralty, and rather than imposing artificial constraints on their designers similar to the restrictions of the British "Establishments," gave them a relatively free hand. It is clear that *Invincible* made an immense impression on the English naval officers who saw her. She could manage thirteen knots under suitable conditions, two knots faster than her British contemporaries, and immediately after her capture, Anson remarked that she was "a prodigious fine ship, and vastly large." Warren, who later flew his flag in her, commented that "she is better in every way than any ship, and in every way a fine ship of war." Encomiums were also forthcoming from Keppel and Boscawen, so it is not surprising that a decision was made to copy the design. *Valiant* and *Triumph* were accordingly ordered in 1757. Although from 1779 onwards, the French prize *Courageux*, a somewhat longer 74, became the preferred model for subsequent British ships, the influence of *Invincible* cannot be overlooked. The 74 remained the backbone of the Line of Battle until 1811, when Seppings introduced a new system of construction, using diagonal elements, which allowed the building of longer two-deckers with 80 and 90 guns, and the 74-gun ship was finally rendered obsolete.

The importance of the Dockyards in the Industrial Revolution has been exhaustively examined by Jonathan G. Coad in his *The Royal Dockyards 1690-1850*, (London: Scholar Press, 1989), and Lavery likewise points out that, although Chatham itself was described by one visitor as "a long, narrow, ill-built little town," its Dockyard was a very significant industrial complex by eighteenth-century standards, employing 1,700 men. He explains how this immense operation was run by a Commissioner appointed by the Navy Board, and outlines the activities of the various supervisors — Master Shipwright, Master Sailmaker, Master Boatbuilder, and so on.

The book follows the building of *Valiant*, starting with the way the plans were drawn up and lofted. Later in the century, a shortage of suitable timber to build wooden ships, particularly English oak for the frames, reached crisis proportions, but in 1757, the situation was more favorable, and Lavery suggests that it is not coincidental that *Hearts of Oak*, still used as the official marching tune of the Royal Navy, was published in 1759. After the War of Independence, the Navy depended on North America for timber for masts, and *Valiant*'s big spars could have been supplied from this source. Subsequently, mast timber had to be obtained from the Baltic. Lavery describes the methods of transporting, seasoning, and cutting the timbers, and the techniques of framing are illustrated by several excellent photos and diagrams. It was about this time that, rather than using straight planks with four edges for the wales, it became the practice to use five-edged planks, laid in "anchor stock," or "top and butt" pattern. Fine illustrations of these methods are found, by the way, on page 53 of Peter Goodwin's *The Construction and Fitting of the Sailing Man of War 1650-1850* (London: Conway Maritime Press, 1987).

The way the various decks were laid out and space allocated is clearly explained, and among other nuggets we learn that the fish room was separated from other storage areas, so that the smell would not contaminate other items. When fitting out, *Valiant* would have needed about twenty miles of rope for her rigging, and the 1,400 blocks required would have been contracted out, since the Dockyard had only two blockmakers on staff. It seems that contemporary documents consulted by the author distinguished between a "kevel" and a "caval cleat" (p. 138), but I suspect that these were just alternate spellings, both being related to French *cheville*, and having the basic meaning of "peg" or "pin." According to the Oxford English Dictionary, "kevel" in this sense is recorded as far back as 1330 A.D. Among other interesting details, we learn that the vessel's longboat was a shade shorter than the longer of the two pinnaces carried.

The water at Chatham was shallow, so the guns had to be taken aboard further down river at Sheerness, and the book offers clear outline sketches of the 32-, 24- and 9-pounder guns carried, from which it is apparent that the barrels differed surprisingly little in length. *Valiant* may have carried carronades later in her career, but they were not in production at the time of her first commissioning.

A chapter is devoted to how the vessel was manned, and offers some interesting sidelights on the living conditions. For instance, it appears that the men were issued eight pints of beer per day. The coverage on these points is not as comprehensive as in Lavery's masterpiece,

Nelson's Navy: The Ships, Men & Organization 1793-1815 (London and Annapolis, 1989), but is a useful précis of the subject.

The final chapter describes the ship's career in service, including her activities at the landings at Havana in 1762, and at the Glorious First of June in 1794. She was broken up in 1826, and Lavery suggests that some of her timbers were reused and may survive in buildings in the Dockyard today.

The book reviewed here covers some of the same ground as James Dodds and James Moore's *Building the Wooden Fighting Ship* (London & New York: Facts on File, Inc., 1984) and David Roberts translations of Jean Boudriot's monumental four volume *The 74-Gun Ship*, (Rotherfield, 1986-8, originally published as *Le Vaisseau de 74 Canons*, in 1977), but in each case the subject is approached from a different perspective, and each of these authors has something fresh to say on the topic. As always, Brian Lavery's straightahead prose style is very easy to follow, with commendably sparse use of obscure technical terms. *Building the Wooden Walls* is an excellent effort.

JOHN H. HARLAND

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REV. HENRY T. CHEEVER, *The Whale and his Captors; or, the Whaleman's Adventures, and the Whale Biography, as Gathered on the Homeward Cruise of the* Commodore Preble (Fairfield, WA: Ye Galleon Press, 1991 [reprint of 1849 edition]). 314 pages, illustrations. $19.95.

JOHN WILSON, *The Cruise of the* Gipsy. *The Journal of John Wilson, Surgeon on a Whaling Voyage to the Pacific Ocean, 1839-1843*, ed. Honore Forster (Fairfield, WA: Ye Galleon Press, 1991). Xxii + 404 pages, illustrations, bibliography, index. $32.50.

WILLIAM DALTON, *The Dalton Journal: Two Whaling Voyages to the South Seas, 1823-1829*, ed. Niel Gunson (Canberra: National Library of Australia, 1990). Xii + 140 pages, bibliography, index. A$34.95.

These three books have much in common. All are original accounts of the whaling industry, British and American, in the first half of the nineteenth century. All were written by close observers of some aspect of whaling, yet none was a "whaleman" in the usual sense of the word — to be precise, the authors were two surgeons and a clergyman. Two have never been published, and the third, although published at midcentury, is scarce enough to warrant reprinting. All contribute to the literature of whaling, though in rather different ways.

The Reverend Henry Cheever voyaged from his native Maine to Hawaii on a passenger vessel to restore his health. There, in 1844, he joined the whaleship *Commodore Preble* of Lynn, Massachusetts, for her homeward voyage. A capable writer, Cheever found a publisher for his work in New York in 1849, and went on to write other books on whales and the Pacific. *The Whale and his Captors* ranks in value with similar contemporaneous accounts also recently republished: Beale's *Natural History of the Sperm Whale* (1839), Olmstead's *Incidents of a Whaling Voyage* (1844), and Browne's *Etchings of a Whaling Cruise* (1846). Cheever's work is still readable, and contains some interesting if episodic tales. Melville had a copy, and Cheever's narrative of the descent into the deep by the *Preble*'s master, carried down by a whale line, is particularly evocative in this context. Cheever was observant and sensitive, to the point of developing sympathy for the predicament of the whales themselves: "I begin to be somewhat doubtful about the lawfulness and expediency of the whale fishery" (p. 126). His most serious concern, however, was directed toward the immorality, as he saw it, of whaling on the Sabbath, on which point he discourses at considerable length.

In its original form, Cheever's work appeared in rather small print, and it has been enlarged in this edition to 135 percent. Purists may complain, but most readers will be thankful for this readability and for the brief but useful new introduction provided by Honore Forster. Glen Dawson, the publisher of so many important accounts of travel and discovery, counts this as his 487th book. "I love making books," Glen is prone to remark, and his delight has been the scholarly world's gain, for many of the works published at Ye Galleon would not otherwise be available at a reasonable price if at all.

Another example of Dawson's work, this time an original publication, is the important journal of John Wilson, surgeon aboard the London whaleship *Gipsy* in 1839-43. Although Britain was heavily involved in early nineteenth-century whaling, few British logs survive, making an extensive and detailed account such as Wilson's all the more significant. British whaleships were required to carry surgeons, and some literate and capable men took these relatively low-paying jobs (Wilson's "lay" or share was only 1/140th, compared to the seaman's 1/170th or 1/180th), encouraged as much by a glut of medical men in Britain as a desire to see the world. Such men often had little to do aboard, and some useful

journals resulted. Wilson's daily record, with its extensive remarks, particularly upon the various islands visited and their inhabitants, is one of the most extensive of this category.

Wilson was not without his likes and dislikes, but his observations were careful, notably of the terms of trade or the characteristics of whatever particular island population he was describing at the moment. He shared some popular Victorian attitudes, such as a belief in physiognomy and his anti-Catholic and anti-Semitic prejudices. Fortunately, his sense of humor also comes through, for example, in his description of the reaction of natives when he doffed his cap to reveal his total baldness. Wilson does discuss whaling, but he is more interested in the people he encounters. His account is particularly revealing on the different lifestyles found on British whalers. Women, sometimes preteens, frequently appeared on the *Gipsy*, and this might indeed have happened on an American vessel. The prevalence of drunkenness aboard which Wilson recounts, however, would have been most unlikely. "Men who are as sober as Anchorites when located on shore, have a strange & apparently quite overpowering tendency to intoxicating drink [on board], and will commit almost any folly to obtain the stimulus!" (p. 313). A statement on American whalemen would probably be the reverse: forced to be Anchorites aboard, they were notorious drunkards ashore.

Due to the limitations of photographic reproduction, Honore Forster could provide only a short introduction to Cheever's book. In preparing Wilson's manuscript for publication, however, she has had the opportunity to add any necessary explanatory notes. Forster, the author of the authoritative *The South Sea Whaler: An Annotated Bibliography* (1985, and 1991 supplement), is enviably expert on the South Seas and on whaling. Her editorial contribution is not obtrusive, but rather significantly enhances the value of this substantial volume (nine by twelve inches, 404 pages). Its price is a reasonable one for a rare and important journal, the original of which lies in the Royal Geographical Society.

Forster's colleague at the Australian National University, Niel Gunson, has edited another British whaling surgeon's papers in *The Dalton Journal*. William Dalton served in the *Phoenix* (1823-25) and the *Harriet* (1826-29), both of London. The earlier such journals were written, the greater their rarity, and few survive from the 1820s. Such accounts have particular value for students of culture contacts in the South Pacific. Unfortunately, Dalton did not keep a detailed daily record, but rather wrote sporadic entries, often short, but usually in reference to various landfalls. The journal is thus valuable, for example, in adding information to the scholarly debate on whether Wilson's vessel, or the *Phoenix* of Nantucket, first encountered Phoenix Island (Rawaki, Kiribati).

Nevertheless, the question may still be asked whether Dalton's journal merits publication in book form. The actual total text of both voyages together is thirty-eight printed pages, and even that number is achieved only by the questionable practice of introducing into the text quotations from other, specifically medical, writings by Wilson. Such interjections are clearly marked by the editor, but, if really necessary, would be more useful as an appendix. The balance of the book is filled out by a reasonable introduction to the journal; an unnecessarily lengthy memoir on Dalton, his ancestry, and his later career; and, finally, by adopting the practice of printing the journal only on the right-hand page and leaving the left for the editor's comments. It is an irresistible temptation to an editor. The unfortunate result is a surplus of information, both factual and interpretative. For example, Wilson's ship encounters another making for Pernambuco. It is only a brief mention, yet the reader must be enlightened: "Pernambuco, capital of the Brazilian province of that name, was a major trading centre exporting much fine cotton to Britain" (p. 48). At times, the reader is left with little to do: "This paragraph, in particular, reveals Dalton's Evangelical values . . ." (p. 52). Even worse is the addition of irrelevant data: Dalton visited Monterey in California, but not San Diego, where the governor resided in 1827, "so Dalton would not have encountered the foppish Jose Maria de Echeandia who was Governor in 1825-31" (p. 112). The result of such devoted but burdensome editorializing is that a valuable short manuscript, suitable for an excellent article, has been made into an unnecessarily lengthy and expensive volume.

All three of these works are useful, and they all belong in any comprehensive whaling collection, whatever individual failings they may possess. In the case of Wilson and Dalton, they are also important books for the history of Pacific culture contacts.

BRITON C. BUSCH

Colgate University

EDWYN GRAY, *Operation Pacific: The Royal Navy's War Against Japan, 1941-1945* (Annapolis, MD: Naval Institute Press, 1990). Xii + 268 pages.

Although the title of this volume limits itself to the Royal Navy, the book is an attempt to make the British

Imperial naval war effort in the Pacific better known to the American reading public. It is a clearly and gracefully written battle narrative that acquaints the reader with the scope and variety of the Royal and Commonwealth navies' operations against Japan in twelve relatively brief chapters. However, it sidesteps the question of their significance in the prosecution of the war and leaves out most of the diplomatic, strategic, and political contexts in which their actions were fought.

Mr. Gray has sketched the outlines of British decline in Asia between 1903 and 1945. One searches his work in vain, however, for any recognition of that fact. Although an all-encompassing work, it speaks with a single voice and that is British. The author made no attempt to mine the Australian, New Zealand, or Indian naval experiences in the Pacific War.

As the infrequent and sketchy notes indicate, the author is innocent of the last generation of scholarship on imperialism in the Pacific, arms limitation and regional rivalries in East and Southeast Asia, Anglo-Japanese relations in the first half of the twentieth century, and the origins of the Pacific War as well as its conduct. One searches in vain for any mention of non-British official histories, let alone the works of Ian Nish, Roger Dingman, Arthur Marder, Akira Iriye, H.P. Willmott, David Reynolds, James Leutze, William Roger Louis, Christopher Thorne, Raymond Esthus, Stephen Pelz, Bradford Lee or Peter Lowe, among others.

Lack of footnotes is only part of the problem. Deplorably, there is no bibliography. Although the author writes, "The material which forms the basis of this book has been accumulated over many years of writing on naval matters and has been derived from contemporary documents, newspapers, books and conversations and correspondence with very many people . . . ." (p. xi), there is no easy way to learn more about any of the many fascinating subjects introduced. For instance, it would be interesting to be able to find out more about the Arakan Inshore Flotilla, the planning for the invasion of Malaya, British submarine operations against Japanese shipping, the establishment of the Royal Navy's Fleet Train to support its operations in the Western Pacific, the bureaucratic infighting between London, Washington, Honolulu, Canberra, Auckland, New Delhi, and Colombo regarding the commitment of a British Imperial Fleet in the war against Japan, or any of the other topics discussed. The absence of a bibliography makes this task difficult.

In sum, this book is useful and interesting but deeply flawed. Given Mr. Gray's fluid writing style and his ability to synthesize material, his views on the British Imperial strategic and diplomatic context of the Pacific War could have been both interesting and informative. Indeed, the very comprehensiveness of his work points up the question of the significance of the British Imperial effort in the naval war against Japan. In 1945, the British Pacific Fleet was first a Task Force, then a Task Group of the American Navy's Third/Fifth Fleet.

LEWIS BERNSTEIN

Boise State University

MICHAEL L. HADLEY AND ROGER SARTY, *Tin Pots and Pirate Ships: Canadian Naval Forces and German Sea Raiders, 1880-1918* (Montreal and Kingston: McGill-Queen's University Press, 1991). Vi + 303 pages, notes, bibliography, and index.

Tin Pots and Pirate Ships is good history, well-researched and well-written. Against a backdrop of domestic crisis, a world war, and the first transatlantic U-boat threat, Michael Hadley and Roger Sarty examine the many facets of the Canadian naval experience from 1880 through the Great War. This study provides necessary and welcome insights into the problems peculiar to a British dominion struggling to reconcile its own emerging naval and national identity with the very real importance of the traditional ties to Great Britain.

The authors are both Canadian and are well-grounded in their country's naval history. Hadley, a professor in the Germanic Studies Department at the University of Victoria, earned the admiration of naval historians for his work on German U-boat operations against Canada during World War II. Roger Sarty works in a more official capacity, in the Directorate of History, National Defense Headquarters, Ottawa.

With this volume, they make a welcome contribution to a growing corpus of historical literature from both European and North American scholars concentrating on the role of the western hemisphere in turn-of-the-century world politics, grand strategy, and naval affairs. Studies by another Canadian, Holger Herwig of the University of Calgary, have drawn our attention to the role of the United States in Germany's strategic planning and, more recently, to the imperial ambitions of both Germany and Britain in Venezuela. Similar works by Reiner Pommerin and Ragnhild Fiebig-von Hase demonstrate the fascination of the German historical community with their country's interest in the western hemisphere at the beginning of this century. But what role was played during these years by Britain's closest North American ally? Hadley and Sarty

illuminate the Canadian struggle to support the mother country while defining Canadian maritime interests and giving birth to the Royal Canadian Navy.

In its early years, the RCN had to address three very different problems. Internally, not all of Canada's political leaders felt, as did liberal leader Sir Wilfred Laurier and later naval minister C. C. Ballentyne, that Canada had a legitimate need for its own naval force to supplement or replace the protection promised by the British Admiralty. The conservatives in particular did not agree, and the debate over the nature of the RCN and its mission continued throughout this period. Second, the Royal Navy denied that the dominions needed their own navies. Rear Admiral Charles E. Kingsmill, the head of the RCN, daily endured inadequate forces and an Admiralty only marginally interested in the Navy's existence. In their description of Kingsmill's constant trials, Hadley and Sarty demonstrate that the Admiralty worked almost as hard to limit the RCN as it did to defeat the Germans. Finally, both Canada and the United States discovered in the U-boat a weapon of sufficient range and power to endanger the east coast of North America. While the British were ill-prepared to deal with the submarine menace, American antisubmarine warfare (ASW) was primitive at best and Canada simply did not have the ships to address the problem. Captain Herbert Richmond, RN, perceptive director of training and staff duties at the Admiralty, observed that Canada needed, among other things, ". . . a satisfactory settlement of the question of where Imperial and Canadian Naval responsibility begin and end."

This study demonstrates that, in spite of these formidable problems, the RCN still managed to make important contributions to the war effort through ASW net and mine defenses, convoy assembly and control of shipping, and transportation of coal and stores. Although the authors try to suggest otherwise, the lack of agile vessels with sufficient power to damage a U-boat seriously made a more offensive role in confronting the submarine threat impossible.

Tin Pots and Pirate Ships also keeps German policy, strategy, and naval operations constantly before our eyes. The portrait of Admiral Henning von Holtzendorff, the energetic German Admiralty chief, is well-drawn, and the authors provide a good sense of the political considerations that governed the deployment of German submarines in North American waters. Although minimally effective from a military standpoint, the U-boats did prove their range, propaganda value, and potential as attack vessels and minelayers.

Hadley and Sarty have effectively mined the primary sources and secondary literature in this exploration of the RCN's early years. The bibliography cites all of the major works in the field, new and old. In addition, the authors tapped major collections held in Canadian, American, British, and German repositories.

Tin Pots and Pirate Ships will satisfy historians, naval history buffs, and students of Canadian and German history just beginning their study of the RCN and the German U-boat menace during the Great War.

GARY E. WIER

Naval Historical Center

DAVID P. H. WATSON, *The Captains Watson and the Empire Line*, revised edition (Ridgefield CT: Deepwater Publishing Company, 1989). Paper, 180 pages, illustrations. $12.95.

First issued in 1977, this work is a tribute to the Watson family and also a salute to the last days of sail on the oceans of the world. The new edition includes much additional information generated by the distribution of the first printing to maritime museums and historians around the world. The first sentence in the book sets the stage and whets the appetite: "On March 4, 1885, five members of the Watson family, spanning three generations, were on the high seas on sailing ships of the Empire Line owned by George Duncan and Co., of London . . . ." The story covers the careers of Captain John T. Watson (1828-1892) and his son, Captain David Watson (1851-1939) and also records the history of the Empire Line. Captain John was the author's great-grandfather and Captain David was his grandfather. Seven appendices add color and depth to the book.

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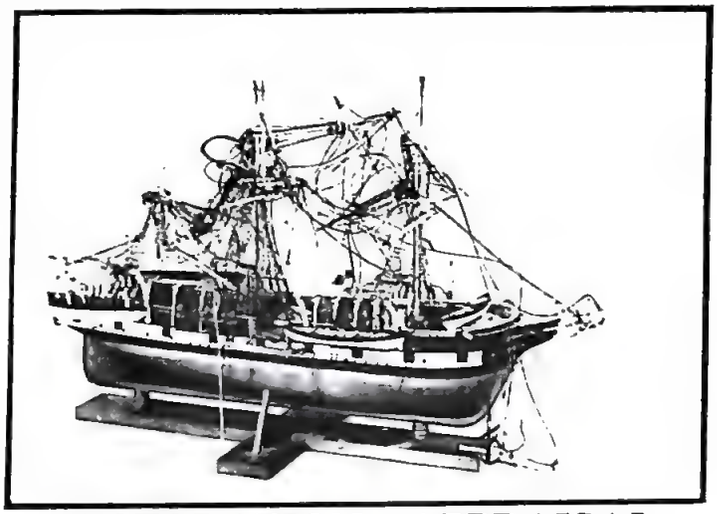

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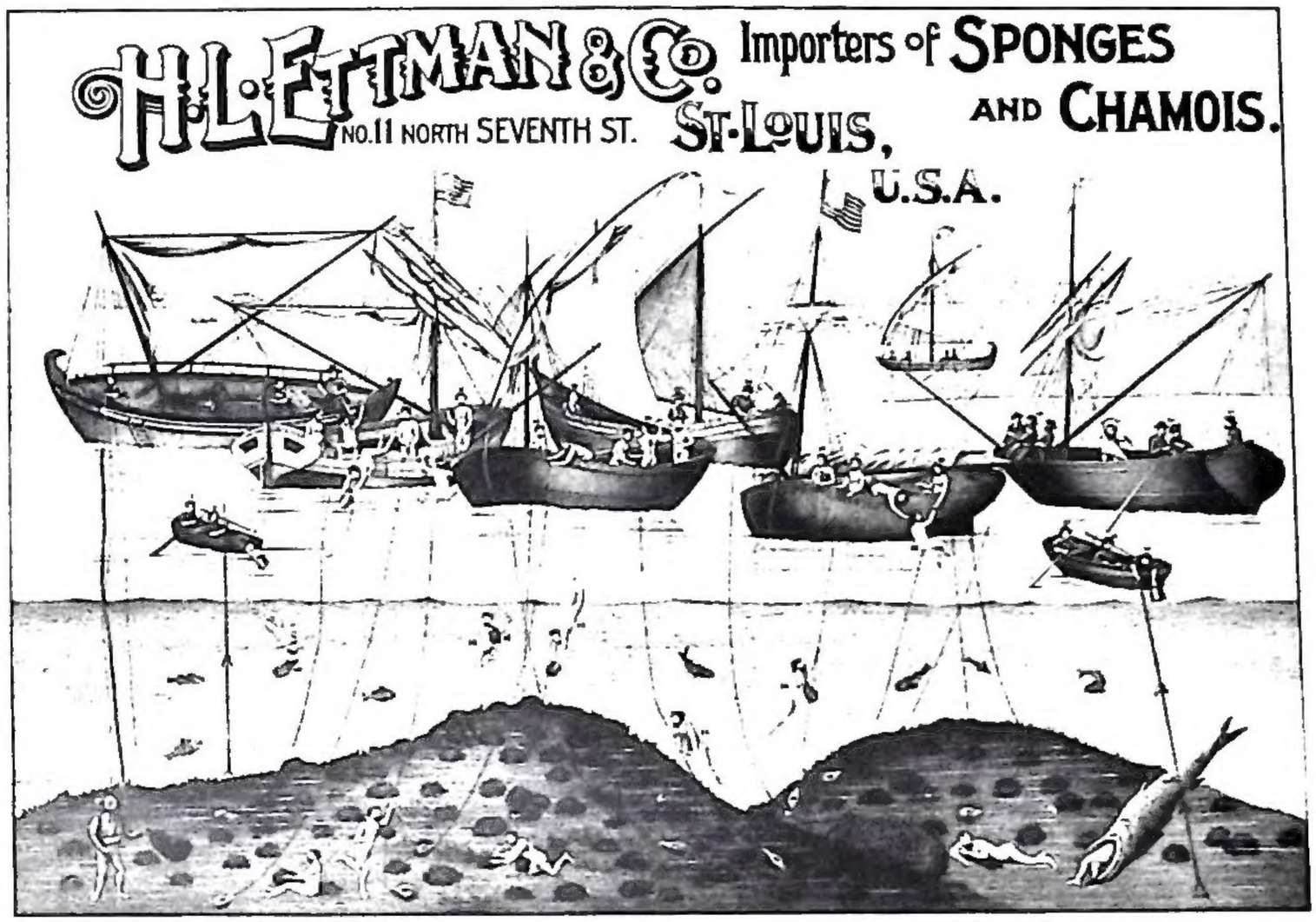

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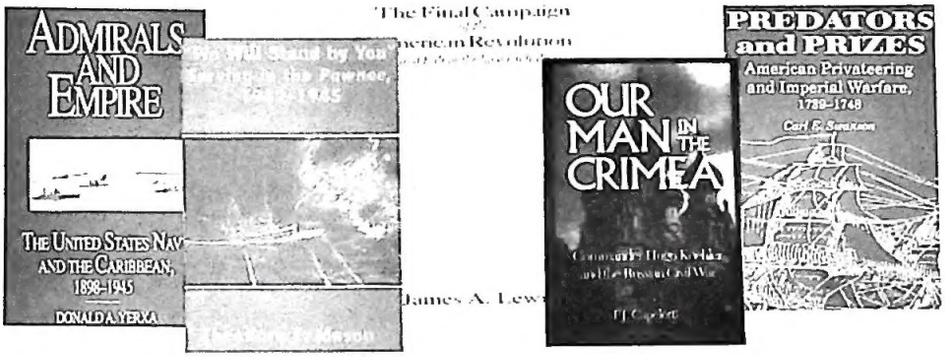

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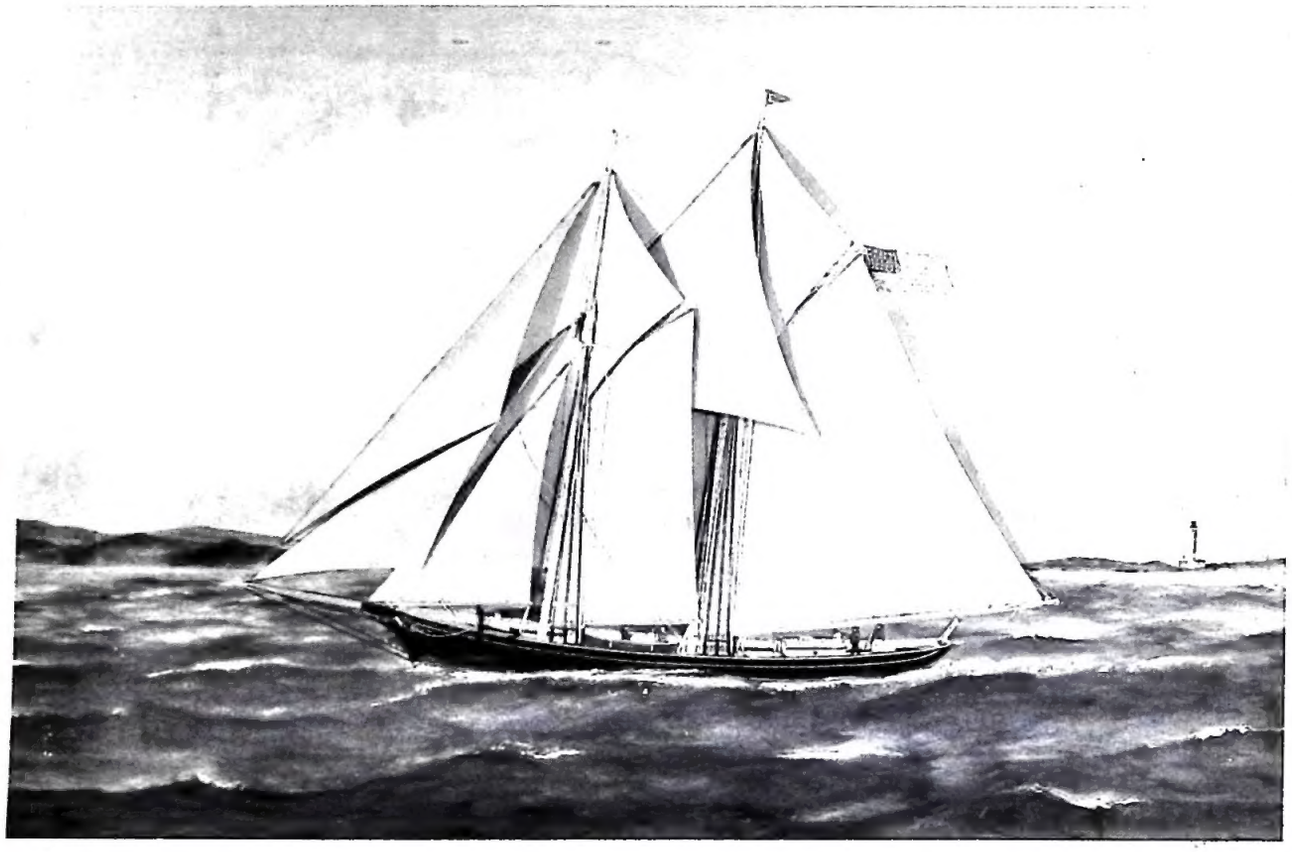

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